VOL. IV MARCH 1953 NO. 3

UNITED STATES ARMED FORCES MEDICAL JOURNAL

Published Monthly by the Armed Forces Medical Publication Agency, Department of Defense

WAYNE G. BRANDSTADT, *Colonel, MC, U. S. A., Editor*
ROBERT J. BENFORD, *Colonel, U. S. A. F. (MC), Associate Editor*
BENNETT F. AVERY, *Captain, MC, U. S. N., Associate Editor*

THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY THE DIRECTOR OF THE BUREAU OF THE BUDGET, 23 JAN. 1953

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1953

For sale by the Superintendent of Documents, U. S. Government Printing Office Washington 25, D. C. Price 45 cents (single copy). Subscription price $5.25 a year; $1.35 additional for foreign mailing.

FOREWORD

The *United States Armed Forces Medical Journal* is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense. The Chairman of the Armed Forces Medical Policy Council and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this *Journal.*

MELVIN A. CASBERG, M. D.,
Chairman, Armed Forces Medical Policy Council,
Department of Defense.

GEORGE E. ARMSTRONG,
Major General, U. S. A.,
Surgeon General, U. S. Army.

LAMONT PUGH,
Rear Admiral, MC, U. S. N.,
Surgeon General, U. S. Navy.

HARRY G. ARMSTRONG,
Major General, U. S. A. F.,
Surgeon General, U. S. Air Force.

NOTICE TO CONTRIBUTORS

Contributions should be typewritten and double-spaced on unruled paper of standard letter size. Nothing should be written in the manuscript that is not intended for publication.

All illustrations should be unmounted. Pictures, prints, or drawings may be fastened on a sheet of paper by means of angular slits for each corner of the illustration; suitable identification can then be made on this sheet. Do not cut out portions of an illustration for reproduction. Photographs should be black and white glossy prints, preferably 4 by 5 or 8 by 10 inches. Do not make any marks on the face or back of the photographs or drawings. Cellophane tape, staples, paper clips, or pins should not be used on illustrations. All charts and graphs must be drawn with black india ink on white paper.

Contributions are to be the original work of the author. Quotations must be accurately and carefully copied and full credit must be given to the source. References, tables, and legends must be double-spaced and on separate sheets. References should be listed according to the Quarterly Cumulative Index Medicus, A. M. A., and the sequence should be as follows: name of the author and initials, title of article, name of periodical, volume number, pages, and month and year. *Example:* Smith, R. O., and Wood, W. B., Jr.: Cellular mechanisms of antibacterial defense in lymph nodes; pathogenesis of acute bacterial lymphadenitis. J. Exper. Med. 90: 567-576, Dec. 1949. Authors are responsible for the accuracy of the bibliographic references.

The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

The editor is not responsible for the safe return of manuscripts and illustrations. All material supplied for illustration, if not original, must be accompanied by reference to the source and a statement that reproduction has been authorized. Recognizable photographs of patients should carry permission to publish.

All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without the permission of the editor of this *Journal* and that editorial privilege is granted to the editor in preparing all material submitted for publication. Authors are urged to keep their articles short.

Address: Editor, U. S. Armed Forces Medical Journal, Armed Forces Medical Publication Agency, 23d and E Streets NW., Washington 25, D. C.

WAYNE G. BRANDSTADT, *Editor,*
Colonel, Medical Corps,
United States Army.

ROBERT J. BENFORD, *Associate Editor,*
Colonel, Medical Corps,
United States Air Force.

BENNETT F. AVERY, *Associate Editor,*
Captain, Medical Corps,
United States Navy.

Monthly Message

Medical research career patterns in the Armed Forces have attained considerable stability since World War II, due in large part to the sustained military and civilian interest in and support of general professional achievement. Nevertheless, certain factors have contributed to the dissuasion of qualified investigative scientists from a career in uniform.

One of the major objections that was formerly raised by individuals contemplating a military medical research career was the lack of assurance of an uninterrupted pursuit of research. It is also the belief of some that a career in research does not afford equal opportunities for promotion with those of other branches of the service.

This entire problem has been one of deep concern to the Armed Forces Medical Policy Council, and at their first meeting of the new year they recognized that research is an essential component of the medical activities of the Armed Forces and must be conducted to a substantial degree by those in uniform. The Council furthermore stressed that a fundamental factor in the correction of inequities in the research career pattern lies in a recognition of research as a stable requirement over and above the operational personnel needs of the services. In the implementation of these factors the Surgeons General have recently taken definite steps to provide stable career patterns for research personnel and to enhance the cause of research in the Armed Forces.

Melvin A. Casberg

Melvin A. Casberg, *M.D., Chairman*
Armed Forces Medical Policy Council
Office of the Secretary of Defense

THE ARMED FORCES MEDICAL POLICY COUNCIL

I. Office of the Chairman *(1)*

THE chairman of the Armed Forces Medical Policy Council is appointed by the Secretary of Defense and serves as the principal advisor and assistant to the Secretary on all medical and health matters relating to the Armed Forces. He is responsible for coordinating the agenda for Council consideration and serves as the presiding officer as well as a member of the Council. He advises the Secretary of Defense of all critical issues under consideration. The chairman, in consonance with

Figure 1. Office of the Chairman, Armed Forces Medical Policy Council. Left to right: Colonel Sheldon S. Brownton, USAF (MC), Executive Officer; Melvin A. Casberg, M. D., Chairman; and Lieutenant Colonel Frank K. Lawford, MSC, USA, Administrative Officer.

(1) The first of four articles on the Armed Forces Medical Policy Council.

views of the Council, represents or arranges for representation of the Department of Defense before and with other governmental departments and agencies on all matters for which the Council has responsibility. He directs, supervises, and controls the staff of the Council and establishes such continuing and temporary committees as may be necessary in carrying out the responsibilities of his office.

Serving as immediate assistants to the chairman are the executive officer and the administrative officer who are responsible for organization, management, personnel, and administration of the Council (fig. 1). In administering the office of the Armed Forces Medical Policy Council, they develop estimates of personnel and other support required to carry out the Council-approved programs. They coordinate, assemble, and distribute the agenda for Council meetings and maintain records of such meetings, following through on actions and policies approved by the Council. A policy register which contains all approved Department of Defense policies on medical and health matters is maintained by this office. At the termination of each fiscal year a comprehensive annual report, which receives wide distribution among military installations as well as numerous civilian medical groups, is prepared. Concise information on Council activities which is included in the semiannual reports of the Secretary of Defense is also furnished. In addition to other public relations activities with professional journals and civilian medical agencies, the executive officer and administrative officer arrange for prominent civilians in medicine and allied fields to attend, as guests, regular meetings of the Council.

Citation for MATS

On 21 January 1953 a Citation of Honor was presented to the Military Air Transport Service (MATS) by the National Foundation for Infantile Paralysis in recognition of MATS' co-operation during the preceding 2 years in transferring patients with poliomyelitis for treatment and in flying essential equipment into epidemic areas during emergencies. The citation was made on the occasion of the MATS' hundredth transfer of such patients for the Foundation.

THE EPIDEMIOLOGY OF INFECTIOUS HEPATITIS[1]

WILLARD R. WARREN, *Captain, MC, USA* [2]

SINCE 1629, when the first epidemic of infectious hepatitis to be reported occurred in Spa, this disease has assumed vast importance as a sporadic and epidemic disease of man with a perverse fondness for military populations. In the European campaigns of the latter half of the eighteenth century, outbreaks of hepatitis became common among troops, and many more military epidemics were reported in the following century. During the Civil War alone 72,000 cases of jaundice were said to have occurred. In World War I the disease first appeared among British troops in Alexandria in 1915, and thereafter broke out in all armies on all fronts, often with a startling morbidity and a corresponding loss in military effectiveness. The magnitude of the problem which this disease presented to the Armed Forces in World War II is well illustrated by the American experience in the Mediterranean Theater, where between 1 January 1943 and 31 March 1945, 35,000 cases occurred *(3)*. This represented a loss in manpower equivalent to nearly 2 infantry divisions.

The prevention and control of infectious hepatitis are matters of first importance from a purely military point of view. Preventive measures must be based on an intimate knowledge of the epidemiology of the disease and, in particular, of its precise mode or modes of spread. Current information on this subject is fragmentary, although marked advances have been made in recent years and reasonably well supported epidemiologic theories have been adduced. Progress in this field has been hampered, however, by inability (1) to isolate the infective agent and follow its transmission by inoculating animals and (2) to examine the aspects of immunity in the population by skin tests or serologic

---

(1) This study is concerned only with the naturally occurring form of the disease, with an incubation period of about 30 days, insofar as it is possible to distinguish this from serum hepatitis.

(2) Walter Reed Army Hospital, Washington, D. C.; formerly Chief of Preventive Medicine Section, Office of the Surgeon, Berlin Command, Office Military Government United States.

(3) Gauld, R. L.: Epidemiological field studies of infectious hepatitis in the Mediterranean Theater of Operations; clinical syndrome, morbidity, mortality, seasonal incidence. Am. J. Hyg. 43: 248-254, May 1946.

examination (4). An attempt is made herein to evaluate recent experience with the epidemiology of hepatitis as described in reports of outbreaks in the past 15 years and to present certain personal observations on the transmission of the disease in a military community.

REVIEW OF THE LITERATURE

The medical literature of the past 15 years is summarized in table 1. The following modes of spread were suggested: (1) respiratory or droplet transmission; (2) unspecified contact transmission; (3) intestinal-oral or enteric transmission; and (4) indeterminate.

Respiratory or droplet transmission was suggested in 12 reports. Lisney (5), Newman (6), Nicol (7), Edwards (8), Ford (9), and Hardy and Feemster (10) reported outbreaks in which case-to-case transmission as a result of close personal contact was a prominent feature. Serial transmission at intervals of about 30 days and infections of one or more members of a household were frequently observed. In most instances, spread of the disease by means of water, milk, food, insect vectors, poor sanitation, or fomites was thought to have been ruled out. Ford, however, pointed out that respiratory transmission was not definitely proved and that dissemination could have occurred by means of fecal contamination of fingers.

Cullinan (11) reviewed 23 outbreaks. Because of the frequency of case-to-case transmission, especially in families and dormitories, he considered spread by droplet infection to be likely. Van Rooyen and Gordon (12) reported an epidemic among British troops in the Mediterranean area in which droplet infection seemed to be the mode of transmission. They noted, however, that the peak incidence of hepatitis followed that of dysentery by about 1

---

(4) Ryssing, E.: Epidemiology of infectious hepatitis elucidated by studies on its morbidity. Acta med. Scandinav., supp. 234, pp. 290-298, 1949.

(5) Lisney, A. A.: Epidemic of catarrhal jaundice in school children. Brit. M. J. 1: 703-706, Apr. 3, 1937.

(6) Newman, J. L.: Infective hepatitis; history of outbreak in Lavant Valley. Brit. M. J. 1: 61-65, Jan. 17, 1942.

(7) Nicol, C. G.: Epidemic catarrhal jaundice. Brit. M. J. 1: 466, Apr. 11, 1942.

(8) Edwards, L. R. L.: Outbreak of epidemic catarrhal jaundice. Brit. M. J. 1: 474-475, Apr. 17, 1943.

(9) Ford, J. C.: Infective hepatitis; 300 cases in outer London borough. Lancet 1: 675-678, May 29, 1943.

(10) Hardy, H. L., and Feemster, R. F.: Infectious hepatitis in Massachusetts, with review of present knowledge. New England J. Med. 235: 147-157, Aug. 1, 1946.

(11) Cullinan, E. R.: Epidemiology of jaundice. Proc. Roy. Soc. Med. 32: 933-950, June 1939.

(12) Van Rooyen, C. E., and Gordon, I.: Some experimental work on infective hepatitis in M. E. F. J. Roy Army M. Corps 79: 213-225, Nov. 1942.

TABLE 1. *Summary of literature of past 15 years*

Author	Population or location	Number of cases	Period	Mode of transmission
Gauld (3)	Military	35,000	1 January 1943 to 31 March 1945	Respiratory and enteric
Lisney (5)	Leicestershire (students)	40	–	Droplet
Newman (6)	Rural	33	–	Air-borne
Nicol (7)	Yorkshire	12	2 months	Droplet
Edwards (8)	Urban	64	8 months	Droplet
Ford (9)	Suburban	300	–	Droplet
Hardy and Feemster (10)	Massachusetts	151	1945	Droplet
Cullinan (11)	England	1,900	1926 to 1939	Droplet
Van Rooyen and Gordon (12)	Military	–	–	Droplet
Dixon (13)	Military	–	1938 to 1942	Droplet
Lisney et al. (14)	Leicestershire	1,017	1936 to 1943	Droplet
Getty (15)	Military	241	18 August to 8 November 1944	Respiratory
Sergeant (16)	Students	44	January to September 1937	Contact
Martland and Winner (17)	Hospital	4	19 to 26 July 1939	Contact (?)
Selander (18)	Urban and rural	–	–	Contact
Kligler et al. (19)	Camp	491	1 July 1942 to 31 March 1943	Contact
Cookson (20)	Gloucestershire	246	1943	Contact
Somerville and Clark (21)	Urban	74	2 years	Contact
McFarlan (22)	Military	–	–	Contact
Davis and Hanlon (23)	Urban	276	1 September 1944 to 1 June 1945	Contact (Enteric or respiratory?)
Pearson (24)	Students	11	2½ months	Contact
McLeod (25)	Institution	100	13 months	Contact
Paul and Gardner (26)	Military	–	1946 to 1950	Contact
Meenan (27)	Family	2	14 January to 27 February 1951	Contact
MacCallum et al. (28)	East Anglia	–	1943 to 1947	Contact

TABLE 1. *Summary of literature of past 15 years*— Continued

Author	Population or location	Number of cases	Period	Mode of transmission
Gezon (29)	Military	73	September to November 1943	Enteric
Walker (30)	Military	–	Summer and fall 1943	Enteric
Barker et al. (31)	Military	1,172	February to November 1944	Enteric
Evans (32)	Hospital	65	Winter 1941 and spring 1942	Enteric
Gowen (33)	Military	400	5 months	Enteric
Kunkel and Hoagland (34)	Family	9	5 months	Enteric
Capps et al. (35, 36, 37)	Nurses	73	7 years	Enteric
Spooner (38)	Military	–	–	Fly-borne
Kirk (39)	Military	1,059	–	Fly-borne
Van Rooyen and Kirk (40)	Military	2,095	August 1942 to January 1943	Fly-borne
Trussell (41)	Military	100	–	Fly-borne
Read et al. (42)	Students	24	26 May to 5 June 1944	Food-borne
Murphy et al. (43)	Urban	10	21 May to 28 June 1945	Milk-borne
Dohmen (44)	Military	84	August to November 1940	Water-borne
Hallgren (45, 46)	Various	–	–	Water-borne and contact
Neefe and Stokes (47)	Camp	350	13 weeks	Water-borne
Hayward (48)	Urban	52	October 1945 to April 1946	Water-borne
Rabe (49)	Urban (military)	31	November and December 1946	Water-borne
Potts (50)	Military	26	1 April to 30 September 1947	Water-borne
Harrison (51)	Military	100	27 March to 17 April 1945	Water-borne
Olin (52)	Hotel	34	July 1944 to April 1945	Water-borne

TABLE 1. *Summary of literature of past 15 years*—Continued

Author	Population or location	Number of cases	Period	Mode of transmission
von Bormann et al. (53)	Urban and rural	–	–	Indeterminate
Cree and Brown (54)	Urban and rural	199	–	Indeterminate
Lys (55)	Urban	614	June 1942 to May 1943	Indeterminate
McKinlay and Truelove (58)	Military	–	1944	Indeterminate
Ipsen (60)	Denmark	–	1943 to 1947	Indeterminate
Rewerts (62)	Family	8	2 months	Indeterminate
Wolff and Teusch (63)	Saar	–	1948	Indeterminate (enteric?)
Jacobi and Mertens (64)	Urban	–	1944 to 1950	Indeterminate
Gowen (61)	Military	–	Winter 1944 and spring 1945	Indeterminate
Alsted (59)	Denmark	–	1944 to 1948	Indeterminate
Bjørneboe (57)	Scandinavia	–	–	Indeterminate
Ryssing (4, 56)	Urban	–	–	Indeterminate

month in many areas. Dixon (13) described the experience with hepatitis in Malta and concluded that the disease was spread by droplets in spite of the observation of a definite parallelism with gastrointestinal infections which preceded the outbreaks of jaundice by about 1 month. Lisney (14) reported 5 winter epidemics of hepatitis in which serial transmission was a prominent feature, and in which spread seemed to the author to be by droplet infection. No evidence for transmission by water, food, or vermin was found.

Getty (15) reported an epidemic of hepatitis in a division newly removed from combat in the South Pacific. Twenty-five of the 241 cases occurred in a unit which had been on shipboard at the time of probable infection with the virus, and because enteric, food-borne, and water-borne transmission were considered

(13) Dixon, H. B. F.: Notes on infective hepatitis in Malta, 1938-1942. J. Roy Army M. Corps 82: 44-48, Jan. 1944.

(14) Lisney, A. A.; Ford, J. C.; Newman, J. L.; and Davis, E.: Discussion on infective hepatitis; recent field investigations. Proc. Roy. Soc. Med. 37: 165-171, Feb. 1944.

(15) Getty, R. W.: Epidemiologic study of epidemic hepatitis. U. S. Nav. M. Bull. 46: 541-553, Apr. 1946.

unlikely on a naval vessel, it was concluded that spread was probably by the respiratory route. This same unit, however, had spent much time in and about Japanese native villages where sanitation was poor and conditions for acquiring filth-borne diseases were ideal. It had the highest incidence of hepatitis of any component of the division. Gauld *(3)* studied the epidemiologic experience with hepatitis in the Mediterranean Theater in World War II and concluded that the disease is usually spread by person-to-person contact via the respiratory or enteric routes, generally the former. As evidence in support of the respiratory theory of transmission, he cited epidemics in which the case distribution conformed to sleeping quarters, and the fact that the incidence of hepatitis was higher in headquarters companies than in combat units in the 1943-1944 outbreak. The statistics quoted for the 1944-1945 outbreak, however, tend to vitiate the latter argument, for they show a higher incidence in combat companies than in headquarters troops.

Unspecified contact transmission. Thirteen reports fell into this category. Several outbreaks occurring variously in camps, army units, hospital personnel, towns, and provinces were reported *(16–24)*. Case-to-case transmission as a result of close personal contact was common to all of these outbreaks. Multiple cases in families and serial transmission at intervals of about 30 days were frequently noted. In most instances there seemed to be no relationship with enteric or respiratory disease, and dissemination by water, milk, or food was ruled out. Most of the authors believed that droplet transmission was unlikely, though Somerville and Clark *(21)* suggested it as a possibility. Gaps in the chain of transmission were often observed, and Cookson *(20)* suggested carriers or subclinical cases as an

---

(16) Sergeant, B.: Epidemic catarrhal jaundice in school children. Brit. M. J. 2: 703, Oct. 9, 1937.

(17) Martland, E. M., and Winner, A. L.: Epidemic jaundice: hospital outbreak. Lancet 1: 161-163, Jan. 21, 1939.

(18) Selander, P.: Epidemischer und sporadischer Ikterus; eine statistisch-epidemiologische und klinische Untersuchung. Acta paediat. (supp. 4) 23: 3-251, 1939.

(19) Kligler, I. J.; Bteah, D. S.; and Koch, W.: Observations on 2 epidemics of infective hepatitis in Palestine among recent immigrants. J. Infect. Dis. 74: 234-246, May-June 1944.

(20) Cookson, J. S.: Epidemic infective hepatitis in Gloucestershire. Brit. M. J. 1: 687-689, May 20, 1944.

(21) Somerville, A., and Clark, J. S.: Epidemic jaundice. Canad. M. A. J. 51: 120-123, Aug. 1944.

(22) McFarlan, A. M.: Epidemiology of infective hepatitis in some units of British Army in Sicily and Great Britain, 1943-1944. Quart J. Med. 14: 125-146, July 1945.

(23) Davis, D. J., and Hanlon, R. C.: Epidemic infectious hepatitis in small Iowa community. Am. J. Hyg. 43: 314-325, May 1946.

(24) Pearson, H. E.: Outbreak of infectious hepatitis in rural school. Stanford M. Bull. 6: 444, 1948.

explanation of these. McLeod *(25)* reported an outbreak of hepatitis in an institution for the feeble-minded, wherein the incidence of the disease increased in direct proportion to the degree of mental deficiency. This was interpreted as evidence favoring contact transmission.

Paul and Gardner *(26)* reviewed the American experience with hepatitis in postwar Germany and concluded that most cases were acquired "as a result of direct personal contact with German people or in German households." They found no relationship between the hepatitis curve and that of respiratory disease, pneumonia, mumps, dysentery, or diarrhea. There was some circumstantial evidence for parenteral transmission of the disease. Meenan *(27)* reported an unusual case in which hepatitis was apparently acquired by kissing. MacCallum et al. *(28)* described the results of studies on the epidemiology of hepatitis in East Anglia which pointed to spread of the disease through contact. Field investigations there disclosed a mode of transmission similar to that of poliomyelitis. Water- and food-borne epidemics were said to be unusual.

Intestinal-oral or enteric transmission. The 24 articles reporting outbreaks which belong in this category may be further classified according to the type of enteric transmission found:

1. *Miscellaneous.* Gezon *(29)* reported an epidemic of hepatitis in a military unit in Tunisia. Dysentery had been prevalent during the preceding 6 months, though a history of diarrhea was no more common in the patients with hepatitis than in a control group. Walker *(30)* described an epidemic in U. S. troops in North Africa which had been preceded by a high incidence of dysentery about a month earlier. Contact spread was not a common feature, but there did seem to be an association of the disease with insect-ridden areas. Barker et al. *(31)* studied over 1,000 unselected cases occurring in the Mediterranean Theater and concluded that spread of the disease was chiefly by the enteric route.

---

(25) McLeod, K. W.: Epidemic of common infectious jaundice. J. Pediat. 24: 454-469, Apr. 1944.

(26) Paul, J. R., and Gardner, H. T.: Symposium on viral hepatitis; endemiologic aspects of hepatitis in U. S. troops in Germany 1946-1950. Am. J. Med. 8: 565-580, May 1950.

(27) Meenan, P. N.: Late infectivity in hepatitis. Lancet 1: 447-448, Feb. 24, 1951.

(28) MacCallum, F. O., et al.: Infective hepatitis: studies in East Anglia during the period 1943-1947. Spec. Rep. Ser. Med. Res. Coun. Lond. No. 273, 1951.

(29) Gezon, H. M.: Investigation of a jaundice epidemic in Tunisia; preliminary report. U. S. Nav. M. Bull. 43: 579-589, Sept. 1944.

(30) Walker, D. W.: Some epidemiological aspects of infectious hepatitis in U. S. Army. Am. J. Trop. Med. 25: 75-82, Mar. 1945.

(31) Barker, M. H.; Capps, R. B., and Allen, F. W.: Acute infectious hepatitis in Mediterranean theater, including acute hepatitis without jaundice. J. A. M. A. 128: 997-1003, Aug. 4, 1945.

2. *Contact.* Evans *(32)* reported an epidemic of 65 cases in which case-to-case transmission was usually demonstrable. He noted that nurses were frequently infected by patients, but patients rarely by other patients, and interpreted this as evidence that feces or urine serve as vectors. Gowen *(33)* described a large outbreak of hepatitis among U. S. troops in Tunisia. Although a history of contact was rarely obtained, he concluded that the disease was probably spread by personal contact via the enteric route. He observed a high incidence of nonicteric cases (ratio to icteric cases was 8:1) and this finding doubtless explains the infrequency of a history of contact with a jaundiced person. Many other investigators have commented on the importance of nonicteric or subclinical cases in the dissemination of viral hepatitis. Kunkel and Hoagland *(34)* reported an outbreak involving 9 of 10 children in a family living under very crowded conditions. Contact spread by fecal contamination was considered to be the mode of transmission. Capps et al. *(35–37)* recorded an epidemic among student nurses working in an orphanage. Most of these patients were assigned to a certain floor, where one-third of the children were subsequently found to have abnormal liver function tests. The nursing technics in use were extremely poor. When these were corrected, even though respiratory precautions were not instituted, the outbreak among the nurses ceased. The disease was thought to have been spread from the children (acting as a reservoir of the virus) to the nurses via the intestinal-oral route.

3. *Poor sanitation and flies.* Spooner *(38)*, Kirk *(39)*, and Van Rooyen and Kirk *(40)* described a large outbreak of hepatitis among the British troops on the Alamein Line. Most of the cases occurred in units engaged in an area 5 miles square which had recently been evacuated by the enemy who was known to have

(32) Evans, P.: Comments on epidemic of hepatitis. Brit. M. J. 2: 446-449, Oct. 17, 1942.

(33) Gowen, G. H.: Epidemiology of epidemic hepatitis. Bull. U. S. Army M. Dept. (No. 84) 41-50, Jan. 1945.

(34) Kunkel, H. G., and Hoagland, C. L.: Observations on family epidemic of infectious hepatitis. New England J. Med. 236: 891-897, June 12, 1947.

(35) Capps, R. B.; Bennett, A. M.; and Stokes, J., Jr.: Prolonged outbreak of infectious hepatitis in nurses due to group of small children serving as reservoir of virus. J. Clin. Invest. 29: 802-803, June 1950.

(36) Capps, R. B.; Bennett, A. M.; and Stokes, J., Jr.: Epidemic infectious hepatitis in infants' orphanage; epidemiologic studies in student nurses. Arch. Int. Med. 89: 6, Jan. 1952.

(37) Capps, R. B., and Stokes, J., Jr.: Epidemiology of infectious hepatitis and problems of prevention and control. J. A. M. A. 149: 557-561, June 7, 1952.

(38) Spooner, E. T. C.: The 1942 epidemic of infective hepatitis in Middle East. Proc. Roy. Soc. Med. 37: 171-172, Feb. 1944.

(39) Kirk, R.: Spread of infective hepatitis. Lancet 1: 80-81, Jan. 20, 1945.

(40) Van Rooyen, C. E., and Kirk, G. R.: Spread of infective hepatitis and poliomyelitis in Egypt (Honyman Gillespie lecture). Edinburgh M. J. 53: 529-543, Oct. 1946.

had a high incidence of hepatitis. Here fecal contamination was widespread, unburied corpses were everywhere, and flies were plentiful. In other areas where fly control was good, the incidence of hepatitis was low. The several authors concluded that in this particular epidemic the disease was primarily fly-borne. Trussell *(41)* reported a military epidemic in New Guinea occurring in a region where sanitation was poor. Open trench latrines were in use, mess halls were unscreened, cooking and eating utensils were improperly cleaned, flies were numerous, and conditions in general were most favorable for the spread of any enteric disease. Diarrhea and dysentery were rampant. About 1 month after the institution of proper sanitation, however, the epidemic of hepatitis died out. Here again we seem to be dealing with a fly-borne epidemic.

4. *Food- and milk-borne.* Read et al. *(42)* reported an epidemic involving 26 medical students, all of whom were members of a single fraternity and who ate most of their meals at the fraternity house. No cases occurred among members who ate few or no meals at the house. The authors concluded that the epidemic was probably food-borne, though the food involved or the mechanism of contamination could not be demonstrated. Murphy et al. *(43)* described an outbreak among the customers of a rural dairy. Investigation revealed the dairy to be grossly insanitary, with ample opportunity for fecal contamination of the milk. Moreover, 2 cases of hepatitis had occurred in members of the dairyman's family about a month before the outbreak. The authors believed that circumstantial evidence pointed to milk as the medium of transmission of the disease.

5. *Water-borne.* Dohmen *(44)* reported an outbreak of hepatitis in a German army unit occurring about 1 month after exposure to a badly contaminated water supply at a school in Paris where the troops had been temporarily billeted. The same water supply had been the vehicle of transmission of an earlier epidemic of bacillary dysentery. Hallgren *(45, 46)* described 7 epidemics of hepatitis occurring in communities, institutions, and families.

---

(41) Trussell, R. E.: Epidemiologic aspects of outbreak of infectious hepatitis. Am. J. Hyg. 45: 33-42, Jan. 1947.

(42) Read, M. R.; Bancroft, H.; Doull, J. A.; and Parker, R. F.: Infectious hepatitis—presumably food-borne outbreak. Am. J. Pub. Health 36: 367-370, Apr. 1946.

(43) Murphy, W. J.; Petrie, L. M.; and Work, S. D., Jr.: Outbreak of infectious hepatitis, apparently milk-borne. Am. J. Pub. Health 36: 169-173, Feb. 1946.

(44) Dohmen, A.: Klinische und epidemiologische Beobachtungen bei gehäuftem Auftreten von Hepatitis epidemica. Deut. Militärarzt. 6: 532, 1941.

(45) Hallgren, R.: Epidemic of hepatitis in county of Västerbotten in northern Sweden. I. Acta med. Scandinav., supp. 140: 1, 1943; Bull. Hyg. 19: 506-507, July 1944 (Abstract).

(46) Hallgren, R.: Epidemic of hepatitis in county of Västerbotten in northern Sweden II. Acta med. Scandinav. 115: 23, 1943; Bull. Hyg. 19: 506-507, July 1944 (Abstract).

In 3 of these, transmission was apparently by contact and in the remainder the disease seemed to be water-borne. In all of the latter, the sources of water supply were unsatisfactory and bacteriologic examinations disclosed high counts of *Escherichia coli*. In 3 of these, the epidemic subsided about 1 month following the institution of adequate water purification.

Neefe and Stokes *(47)* investigated a large epidemic at a summer camp in which water from a certain well seemed to be the medium of transmission of the disease. This well had apparently been contaminated by a nearby cesspool which received the excreta of the first patients in the outbreak. Water from the well caused hepatic dysfunction in 4 of 5 human volunteers who ingested it. Hayward *(48)* reported a municipal epidemic in which case distribution corresponded to the course of the city's principal water mains. The water supply was derived from a river which was frequently contaminated by raw sewage at a point near the intake site of the water supply system. It seems likely that the drinking water transmitted the disease in spite of the fact that it was chlorinated and subjected to the other usually adequate forms of treatment.

Rabe *(49)* recorded an epidemic occurring in the American population of a German city. About 1 month before the outbreak the water supply—the sources of which were unsatisfactory and the treatment of which was inadequate—was frequently found to be contaminated with *E. coli*, and diarrhea was prevalent among both the American and the German populations. Circumstantial evidence thus suggested water-borne transmission. Potts *(50)* described an outbreak in 2 ordnance units in which most of the patients had drunk heavily contaminated water intended for industrial rather than drinking purposes. This water was derived from a stream which received the raw sewage from 4 German communities. Other members of the same units, who had not been exposed to the contaminated water, did not develop hepatitis. Harrison *(51)* reported an epidemic in an infantry battalion in which most of the patients were members of 2 companies which had obtained drinking water from a poorly constructed and heavily contaminated well.

---

(47) Neefe, J. R., and Stokes, J., Jr.: Epidemic of infectious hepatitis apparently due to a water-borne agent; epidemiologic observations and transmission experiments in human volunteers. J. A. M. A. 128: 1063-1075, Aug. 11, 1945.

(48) Hayward, M. L.: Epidemiological study of outbreak of infectious hepatitis. Gastroenterology 6: 504-510, June 1946.

(49) Rabe, E. F.: Epidemic of infectious hepatitis. M. Bull., Theater Chief Surgeon, European Theater (No. 3) 2: 2-14, Mar. 1947.

(50) Potts, C. E., Jr.: Outbreak of infectious hepatitis. M. Bull., Chief Surgeon, European Command (No. 4) 4: 2-10, Dec. 1947.

(51) Harrison, F. F.: Infectious hepatitis; report of outbreak, apparently water-borne. Arch. Int. Med. 79: 622-625, June 1947.

Olin *(52)* recorded an outbreak occurring in a hotel which obtained its water supply from a small lake. Sewage from the hotel emptied into the same lake at a point about 60 meters from the water inlet. The drinking water was inadequately treated and was frequently found to be contaminated with coliform organisms. Water-borne transmission of the disease was considered likely. In several of the above-mentioned reports the occurrence of a few secondary cases in which transmission was apparently by means other than water was described.

Indeterminate. Thirteen reports fell into this category. von Bormann et al. *(53)* investigated epidemics of hepatitis in 6 German villages but reached no definite conclusions as to the mode of spread of the disease. He did note, however, an association of a high attack rate with a history of close contact in school or home. Cree and Brown *(54)*, describing their experience with hepatitis in 2 areas in Wisconsin, observed that in both of these districts conditions were favorable for air-borne, contact, and water-borne transmission, but that evidence obtained did not lend conclusive support to any of the currently held theories as to the dissemination of the disease. They suggested that other possible means of transmission should be explored. Lys *(55)* reported a large epidemic in Basel but did not speculate as to the precise mode of spread. Many features suggested a contact type of infection, however. Ryssing *(4)* studied the epidemiology of hepatitis in Denmark and found a striking similarity between its characteristic morbidity and that of poliomyelitis. He concluded that the 2 diseases are probably transmitted in a similar fashion. Several other investigators have commented on the resemblances in the epidemiology of these 2 diseases *(28, 40, 56, 57)*. McKinlay and Truelove *(58)* described the experience with hepatitis in certain allied troops in Italy. Although they reached no conclusions as to the mode of spread, they found

---

(52) Olin, G.: Hepatitis epidemic presumably spread by water. Acta med. Scandinav., supp. 196, pp. 381-391, 1947.

(53) von Bormann, F.; Bader, R. E.; Deines, H.; and Unholtz, K.: Hepatitis epidemica in Deutschland. Beitrage z. Hyg. u. Epidem. 1: 9, 1943; Bull. Hyg. 19: 921, Dec. 1944 (Abstract).

(54) Cree, E. M., and Brown, J. W.: Observations on epidemiology of infectious hepatitis. J. Lab. & Clin. Med. 37: 104-121, Jan. 1951.

(55) Lys, J.: Die Hepatitis epidemica in Basel, 1941-1943. Gesundheit u. Wohlfahrt 24: 170, 1944; Bull. Hyg. 19: 673, Sept. 1944 (Abstract).

(56) Ryssing, E.: Hepatitis in Copenhagen. On cause of frequency of chronic hepatitis during epidemic in the forties. Acta med. Scandinav. (supp. 239) 138: 66-77, 1950.

(57) Bjørneboe, M.: On variations in frequency of acute hepatitis; application of Helge Petersen's theories to epidemic curve for hepatitis. Acta med. Scandinav. (supp. 206) 386-389, 1948.

(58) McKinlay, P. L., and Truelove, S. C.: Epidemiology of infective hepatitis among Allied troops in Italy. Brit. J. Social Med. 1: 33-50, Jan. 1947.

342918 O - 53 - 2

no evidence of droplet transmission. Alsted *(59)*, Ispen *(60)*, and Ryssing *(56)* discussed recent observations on hepatitis in Denmark, but did not establish the means of transmission involved. Gowen *(61)*, Rewerts *(62)*, Wolff and Teusch *(63)*, and Jacobi and Mertens *(64)* also reported outbreaks in which the method of spread was not clearly established, though valuable observations on the epidemiologic behavior of the disease were made.

Comment. On the basis of the above observations, the following conclusions seem justifiable.

1. Acute infectious hepatitis can be, and most frequently is, spread by personal contact between a susceptible person and one with an overt or subclinical infection.

2. There is little or no tangible evidence that this contact type of infection is mediated by respiratory droplets, or that the respiratory route is in any way involved in the transmission of the disease. In most of the hitherto reported epidemics in which the respiratory or droplet routes have been incriminated, transmission could be equally well or better explained on the basis of intestinal-oral infection by means of contact. For practical purposes, it would seem expedient to dismiss the respiratory theory as unlikely, if not disproved.

3. There is, on the other hand, a large body of epidemiologic evidence to support the theory that infectious hepatitis is transmitted via the enteric route. Indeed, hepatitis may properly be looked on as a primarily enteric disease which may be transmitted not only by contact but also by water, milk, food, flies, and presumably fomites. Moreover, the enteric theory is thoroughly in keeping with the abundant experimental work which has demonstrated conclusively that the infectious agent is present in the stools of patients and that the disease can be transmitted to man by the feeding of infected feces.

4. From the point of view of preventive medicine, therefore, it would seem that outbreaks of hepatitis should be managed with the measures appropriate for the investigation and control of any enteric disease.

---

(59) Alsted, G.: Outbreak of malignant hepatitis. Acta. med. Scandinav. (supp. 206) 130: 357-375, 1948.

(60) Ipsen, J., Jr. (Boston): Epidemic of infectious hepatitis, predominantly of adults and highly fatal for elderly women. Am. J. Hyg. 51: 255-263, Mar. 1950.

(61) Gowen, G. H.: Observations on infectious hepatitis in Seventh Army, 1944-45. Bull. U. S. Army M. Dept. 6: 456-461, Oct. 1946.

(62) Rewerts, G.: Zur Epidemiologie der Hepatitis epidemica. Deutsche med. Wchnschr. 75: 805-806, June 9, 1950.

(63) Wolff, L. (Saarbrücken), and Teusch, W.: Ueber die hepatitis epidemica. Med. Monatschr. 3: 660-665, Sept. 1949.

(64) Jacobi, J., and Mertens, E.: Hepatitisfragen. Deutsche med. Wchnschr. 75: 1323-1327, Oct. 6, 1950.

REPORT OF AN OUTBREAK

From the earliest days of the Occupation in Germany the hepatitis rate for American troops stationed in Berlin exceeded by a large margin that of the European Command as a whole, which in turn was much higher than the rate for troops stationed in the United States (fig. 1). In the winter of 1947-1948, an investigation was carried out by the Preventive Medicine Section of the Berlin Command Surgeon's Office in an effort to ascertain

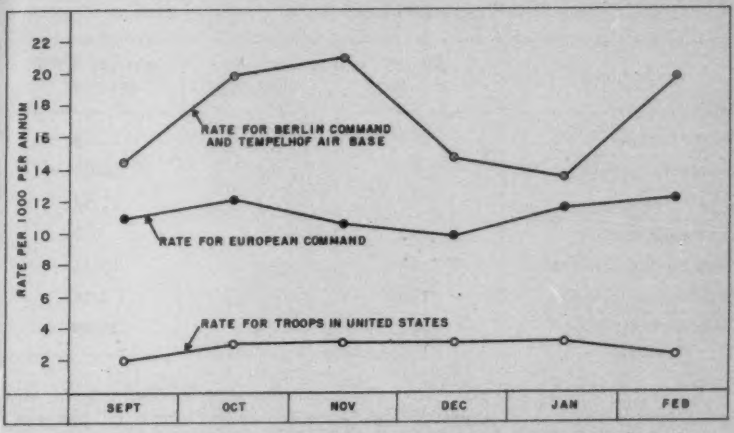


Figure 1. Comparison of hepatitis rates from September 1947 through February 1948.

the causes of this phenomenon. The period from September 1947 through February 1948 was chosen as the area for study because it corresponded with the seasons of highest incidence of the disease. During this period 52 members of the command (the population of which numbered about 6,000) acquired hepatitis. These were scattered throughout the various units of the post, with no remarkable localization as to time or place (table 2). On each of these patients a careful questionnaire which furnished data for a portion of this study was prepared.

In accordance with the current theories as to the mode of transmission of hepatitis, the following possibilities were systematically investigated to determine which of them might be applicable to the situation in Berlin: (1) contact transmission; (2) transmission by means of blood derivatives or contaminated syringes; (3) respiratory or droplet infection; (4) carrier transmission; (5) water-borne infection, and (6) food-borne infection. The findings in each of these categories are presented below.

Contact transmission. Only 14 of the 52 patients (27 percent) had a history of recent contact with a jaundiced person. In 7 of

these the contact had been frequent or intimate, while in the remainder it had been casual or rare. In comparison with many other reported epidemics, a history of contact in the present study was infrequent. This may be interpreted as indicating either that many patients acquired the disease as a result of contact with a person having a subclinical infection or a carrier; or that contact transmission played a small part in spreading the disease in this community.

TABLE 2. *Incidence of hepatitis in the principal troop compounds of the Berlin Command from September 1947 through February 1948*

Compound	Mean strength	Number of patients	Rate per 1,000 per year
Patton Barracks	831	5	12.03
Roosevelt Barracks	1350	18	26.67
McNair Barracks	1215	7	11.52
Andrews Barracks		0	0
279th Station Hospital	392	3	15.31
7782d Special Troops	770	1	2.59
Tempelhof Air Base	667	7	20.99

Transmission by blood or contaminated syringe. Only 1 of the 52 patients gave a history of having had an infusion of plasma, and the time that had elapsed since its administration exceeded the upper limits of the incubation period of homologous serum jaundice. None of the patients had had a transfusion of whole blood; 42 (80.7 percent) had had blood drawn for tests in the recent past, and 18 (34.6 percent) had been treated for venereal disease. In view of the high incidence of venereal disease in the command, and the fact that a serologic survey of all military personnel was in progress during the period, these high percentages are not necessarily significant. It is likely that the population as a whole would have shown a similar percent who had had recent venipunctures, though unfortunately a control study was not made. Moreover, during the period of study, it was the practice, in accordance with current Army directives, to use a freshly sterilized needle or syringe for each parenteral injection or venipuncture. Thus it seems unlikely that transmission by contaminated needles or syringes played a significant role in this outbreak, though the possibility cannot be excluded.

Respiratory or droplet infection. A comparison between the incidence curves for hepatitis and the common respiratory diseases during the period of study is shown in figure 2. No apparent relationship exists between the two. Throughout most

of the period the incidence of respiratory disease in Berlin was uncommonly low—lower than that of the European Command as a whole—whereas the incidence of hepatitis was high, exceeding that of the European Command. These facts would seem to indicate that in this particular community hepatitis was probably not a respiratory or droplet-transmitted disease.

Carrier transmission. Although the existence of hepatitis carriers has never been proved, there has been good cause to suspect their presence in a number of reported epidemics. It therefore seemed worth while to investigate this possibility in Berlin. Because carriers working as food handlers have often been incriminated in the dissemination of enteric and other diseases, the latter element of the population was selected for screening.

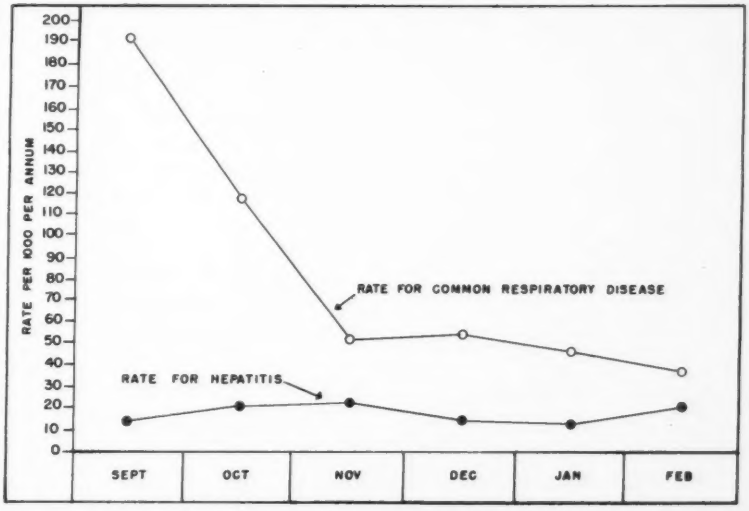


Figure 2. Comparison of rates for the common respiratory diseases and hepatitis from September 1947 through February 1948.

Because Roosevelt Barracks, with a rate of 26.67 per 1,000 per annum, had the highest incidence of hepatitis of any of the several military compounds in the American Sector, the food handlers of this installation were chosen for study. Both the military and the German civilian mess personnel, working in the kitchens and dining rooms of this barracks, were individually interviewed regarding a past history of hepatitis and present symptoms compatible with hepatic disease. Of the 51 military food handlers, 7 had a history of jaundice and another 7 admitted having symptoms suggestive of hepatic disease, such as dyspepsia,

intolerance for fatty foods, and episodes of acholia. Three of the men with a history of jaundice also had symptoms strongly suggestive of continuing hepatic dysfunction. Of the 52 German food handlers, 8 gave a history of jaundice, and 2 had suggestive symptoms. One of these had previously had jaundice. Thus, using these rather crude criteria, 23 carrier suspects were discovered among 103 food handlers.

The 14 military food handlers with gastrointestinal symptoms or a history of jaundice were then studied in greater detail. On each a more complete history, a physical examination, a cephalin-cholesterol flocculation test, and a bromsulphalein test were obtained. Three were found to have had infectious hepatitis in the past year, 2 of them in November 1947. The 4 others had had the disease in 1946, 1945, 1943, and childhood respectively. With the exception of 1, all had had uneventful recoveries. Two of the group had been exposed to hepatitis in November 1947, but had not themselves developed jaundice. Only 1 patient had positive physical findings; he had had hepatitis in November 1947 and still had many gastrointestinal symptoms. His cephalin-cholesterol flocculation and bromsulphalein tests were also positive, and he was subsequently readmitted to the hospital with recurrent hepatitis. In 2 other patients positive cephalin-cholesterol flocculations were obtained without other evidence of hepatic disease. In all other instances, the examinations were negative. Thus, of the whole group of military carrier suspects, only 1 had unequivocal evidence of hepatic disease, though 4 others might reasonably remain under suspicion as carriers because of a recent attack of jaundice or exposure to the disease.

Next, a comparison was made between the incidence of hepatitis in the 10 companies stationed at Roosevelt Barracks and the presence of suspected carriers in the messes of these companies. No correlation was found to exist between the two. Neither was there any concentration of cases in those companies served by the 5 military food handlers who came under the highest suspicion as carriers. Finally, in order to determine whether or not conditions in the kitchens would be favorable for the transmission of an enteric disease should carriers be present, bacteriologic cultures were obtained from various kitchen utensils in 5 of the messes; 60 percent of these were positive for coliform organisms, indicating rather widespread fecal contamination.

In summary, this study adduced no evidence that carriers who were food handlers played any part in the dissemination of hepatitis in this community, in spite of the rather large number of food handlers who might reasonably be suspected of being carriers and the favorable conditions in the messes for carrier transmission of an enteric disease.

Water-borne infection. The water supply of the American Sector of Berlin was derived mainly from deep, suitably constructed wells and was subjected to chlorination to provide a free-chlorine residual of from 0.05 to 0.10 p. p. m. With the exception of the Tempelhof Air Base which had its own chlorinating system and maintained a chlorine residual of about 0.5 p. p. m., all American units stationed in the command used this city water without further treatment.

For a number of reasons, however, the municipal water supply was viewed with suspicion. Both the water and the sewerage systems had suffered extensive damage in the course of the devastating air raids of the war which virtually demolished the city. Repairs during and after the war were often inadequate or of a makeshift nature, with the result that the danger of contamination of the water mains by adjacent damaged sewers was enhanced. Furthermore, during the exceptionally severe winter of 1946-1947, frost penetrated unusually far into the ground, causing breakage of many water and sewer mains, and inflicting further damage on the already weakened systems. Many sewer lines ruptured completely, flooding streets and basements of ruined buildings with raw sewage, not only endangering the water supply but also creating a serious environmental hazard. This widespread fecal contamination remained for many months as a course of potential infection. That the water system was actually invaded by sewage to some degree was demonstrated by frequently positive cultures for coliform organisms observed in routine testing of water specimens collected at various points in the sector. Several studies were therefore undertaken to determine what role, if any, the water supply was playing in the dissemination of hepatitis in the command.

Owing to the high incidence of hepatitis at Roosevelt Barracks, a careful study of the plumbing and sanitary facilities of this installation was made by a sanitary engineer. No cross connections or other deficiencies contributory to the spread of an enteric disease were detected. Moreover, during the period of study the degree of fecal contamination of the water samples collected at this compound was no greater than that observed in the rest of the sector.

Neefe et al. *(65, 66)* demonstrated experimentally that hepatitis virus was inactivated in heavily contaminated water subjected to chlorination yielding a free-chlorine residual of 0.4 p. p. m. at the end of 30 minutes contact, provided that the water had

(65) Neefe, J. R.; Stokes, J., Jr.; Baty, J. B.; and Reinhold, J. G.: Disinfection of water containing causative agent of infectious (epidemic) hepatitis. J. A. M. A. 128: 1076-1080, Aug. 11, 1945.

(66) Neefe, J. R.; Baty, J. B.; Reinhold, J. G.; and Stokes, J., Jr.: Inactivation of virus of infectious hepatitis in drinking water. Am. J. Pub. Health 37: 365-372, Apr. 1947.

been previously treated with coagulants and filtered. Water not pretreated remained infectious in spite of chlorination. When chlorination of the pretreated water was omitted, there was a 40 percent increase in the incidence of hepatitis among volunteers who ingested it. Thus chlorination of water is apparently effective against the hepatitis virus to a degree depending on the pretreatment, the magnitude of the chlorine residual, and doubtless the concentration of the virus. The authors assumed that small quantities of the hepatitis virus could theoretically get into a municipal water system and survive under the proper conditions and that "this could account for some of the occasional small outbreaks of hepatitis or for apparently sporadic cases at widely separated points served by the same source of water." The latter situation seemed to correspond to conditions in Berlin.

TABLE 3. *Results of analysis of routine water specimens*

Month	Number of specimens examined	Average chlorine residual		Specimens with colony count over 10 per cc.	
		Berlin	Tempelhof	Number	Percent
September	34	0.06	0.44	6	17.7
October	34	0.06	0.39	5	14.7
November	32	0.07	0.50	3	9.4
December	29	0.10	0.58	0	0
January	30	0.08	0.69	2	6.7
February	45	0.08	0.64	5	11.1

To further evaluate this possibility, a comparison was made between the average monthly chlorine residuals and the hepatitis rates during the period in question (table 3 and fig. 3). At no time did the chlorine residual reach 0.4 p. p. m., nor was the water supply of the American Sector subjected to pretreatment. Therefore, on the basis of the findings of Neefe et al., it was theoretically possible for the hepatitis virus to survive and be disseminated in the city water supply. Assuming that such contamination had occurred, if the concentration of the virus were low, it is conceivable that it would have been adversely affected to some extent by even the small chlorine residuals that prevailed in this water system and that this effect would have been reflected in the hepatitis rate. Superficially, the graph seems to demonstrate that some such relationship existed between the hepatitis rates and the fluctuations in the chlorine residual. Relatively low residuals in September and October were followed by high hepatitis rates in October and November; a rise in the chlorine

residual in November and December was attended by a fall in the hepatitis rate in December and January; and a fall in the residual in January was followed by a sharp rise in the rate in February.

Two things, however, cast doubt on the validity of these observations: (1) the fluctuations in the chlorine residual were relatively small and perhaps insignificant; and (2) the hepatitis curve closely resembled the usual one observed in the fall and winter months among U. S. troops in Germany, with a peak in October or November and a secondary peak 3 months later. Thus the relationship between this particular curve and the chlorine residual may have been purely fortuitous.

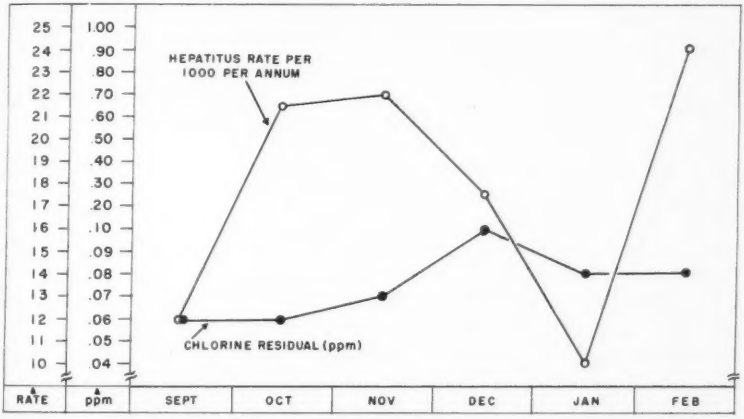


Figure 3. Comparison of hepatitis rates and average chlorine residuals for Berlin Command (exclusive of Tempelhof Air Base) from September 1947 through February 1948.

The situation at the Tempelhof Air Base was unique in that this compound had its own chlorinating system which provided residuals from 5 to 10 times higher than those available to other installations of the Sector. If the virus were water-borne, the incidence of hepatitis might be expected to be lower here than elsewhere, but this compound had the second highest rate in the command. Moreover, in contrast to the command as a whole, there seemed to be no correlation between its average monthly chlorine residuals and its hepatitis rates during the period of study (fig. 4). The significance of these findings is modified, however, by the fact that one facility of the compound (the snack bar) used water direct from the Berlin municipal water system. Thus most of the personnel at the Air Base were frequently exposed to drinking water from the city supply and could have contracted hepatitis from that source.

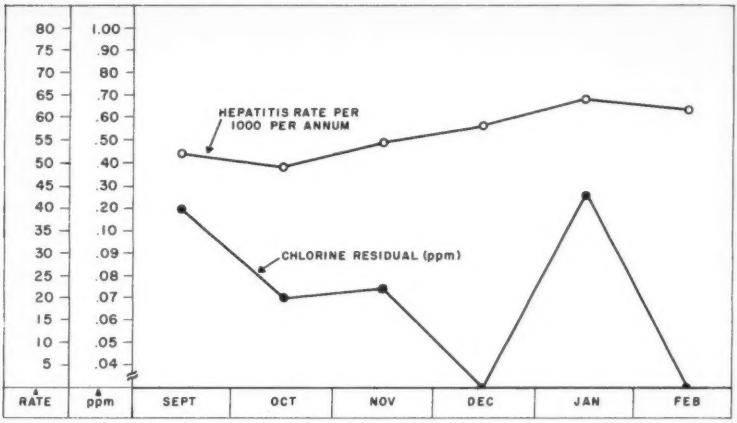


Figure 4. Comparison of hepatitis rates and average chlorine residuals for Tempelhof Air Base from September 1947 through February 1948.

An effort was made to determine whether or not a relationship existed between the incidence of hepatitis and the degree of fecal contamination of the water supply as measured by bacterial colony counts observed in cultures of water specimens obtained in routine sampling. The monthly percent of water specimens from the American Sector, having coliform colony counts of 10 per cc. or above, is shown in figure 5. The relatively high percent of positive counts in September and October was followed

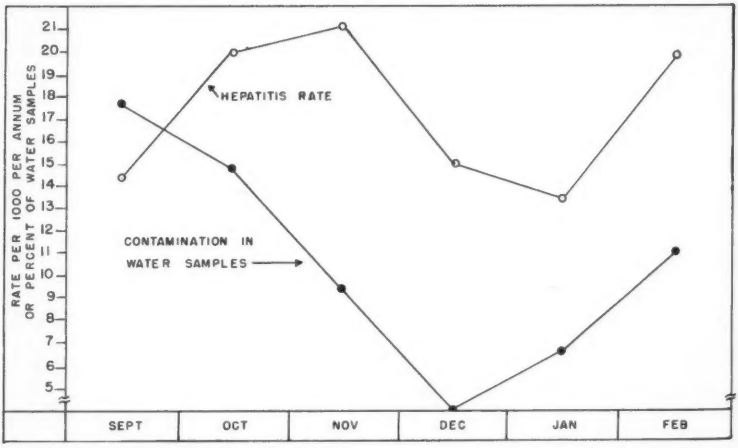


Figure 5. Comparison of hepatitis rates and percent of routine water samples with colony counts of 10 per cc. or above from September 1947 through February 1948.

by high hepatitis rates in October and November; the progressive fall in positive counts in November and December was associated with a drop in the hepatitis rate in December and January; and an increase in the positive counts in January was followed by a sharp rise in the rate in February. Thus there would seem to be a correlation between the degree of fecal contamination of water and the incidence of hepatitis at the expected interval of a month. Here again, however, the relationship might have been only coincidental and the variation in the bacterial colony counts might have been merely a reflection of the fluctuations in the chlorine residual.

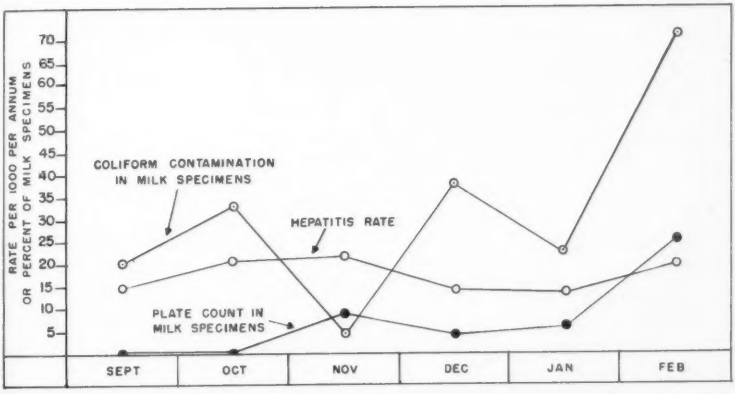


Figure 6. Comparison of hepatitis rates, percent of milk specimens with plate counts of 25,000 per cc. or above, and percent of milk specimens found to contain coliform bacilli from September 1947 through February 1948.

Probably the most that can be said of the above observations is that they are suggestive of, or at any rate consistent with, water-borne transmission of the disease via the municipal water system. The next step in the investigation would logically have been to raise the chlorine residual to relatively high levels and observe the effect of this on the hepatitis rate. Unfortunately, however, the water system of the American Sector intercommunicated freely with those of the other sectors so that chlorination would have had to have been increased throughout the city. This project assumed the proportions of a formidable international undertaking and had to be abandoned.

Food-borne infection. Of the various food products consumed by Americans in Berlin, milk was the only one considered likely to be instrumental in the transmission of hepatitis. Moreover, the milk supply of the command was obtained from Denmark, a country which during the postwar years had an extraordinarily high incidence of infectious hepatitis. During the period of study

the quality of the milk received varied from good to fair. Although most of the samples tested bacteriologically conformed to U. S. Government standards for grade B pasteurized milk, the possibility that hepatitis virus might survive in bacteriologically potable milk had to be considered, and it seemed worth while to try to determine whether or not there was any relationship between the hepatitis rate and the degree of contamination of the milk as estimated by colony counts and cultural characteristics observed in routine bacteriologic testing of milk specimens.

The monthly percent of specimens with plate counts of 25,000 per cc. or over and the percent of specimens containing coliform organisms are shown in figure 6. No consistent relationship seems to exist between these variables and the hepatitis rate. Although the variations in the degree of fecal contamination cannot be correlated with fluctuations in the incidence of hepatitis, it is of interest to note the prevalence of coliform bacilli in this milk supply. These organisms were present in as many as 71.9 percent of samples tested during one period.

DISCUSSION

This study failed to demonstrate either the mode of transmission of hepatitis or the reason for the extremely high incidence in this community, although some useful epidemiologic information was obtained. Certain relevant factors, such as the prevalence of the disease among the German population (for which no reliable statistics were available) and the influence of the widespread fecal contamination of the environment, could not be adequately evaluated. Contact infection did not appear to play a conspicuous role, nor did transmission by blood products, contaminated needles, or syringes seem likely. Dissemination by infected food handlers was thought to be ruled out and there was no evidence in favor of spread by respiratory or droplet infection. Thus, by a process of elimination, transmission via the intestinal-oral route by some means other than contact seems most likely. A detailed investigation of the water supply disclosed conditions compatible with water-borne dissemination of the virus, although no definite conclusions could be drawn on the basis of the data obtained. Further studies along this line appeared promising, but unfortunately could not be carried out. Food could not be incriminated as a vehicle of transmission of the disease, although the milk supply might reasonably be suspected because of the relatively high incidence of coliform contamination found.

CONCLUSIONS

In our present state of knowledge of infectious hepatitis, information regarding the epidemiology of the disease must largely be gleaned from careful study of its behavior in individual out-

breaks and epidemics. Such studies have indicated the possibility of: (1) respiratory or droplet transmission; (2) unspecified contact transmission; and (3) intestinal-oral transmission.

The bulk of the evidence presented was in favor of transmission of the disease via the enteric route, through the agency of contact, water, food, flies, or poor environmental sanitation. Convincing support of the theory of transmission via droplets or the respiratory route was conspicuously scarce, and it would seem that for practical purposes this theory may be discarded.

In an outbreak of hepatitis in a military community conditions were found to be compatible with water-borne transmission of the disease as a result of fecal contamination of the municipal water system. Dissemination by personal contact, contaminated needles and syringes, or milk, though considered unlikely, could not be unequivocally excluded.

BOOKS RECEIVED

Analgesia and Anesthesia in Obstetrics, by *J. P. Greenhill,* M. D., Professor of Gynecology, Cook County Graduate School of Medicine; Attending Gynecologist, Cook County Hospital; Attending Obstetrician and Gynecologist, Michael Reese Hospital; Associate Staff, Chicago Lying-in Hospital, Chicago, Ill. American Lecture Series Publication Number 159, A Monograph in American Lectures in Gynecology and Obstetrics. Edited by *E. C. Hamblen,* M. D., F. A. C. S., Professor of Endocrinology, Associate Professor of Obstetrics and Gynecology, Duke University School of Medicine; Chief of the Division of Endocrinology and Endocrinologist, Duke Hospital, Durham, N. C. 85 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $2.75.

The Medical Annual, A Year Book of Treatment and Practitioners' Index, by 42 contributors. Edited by Sir *Henry Tidy,* K. B. E., M. A., M. D. (Oxon), F. R. C. P., and *A. Rendle Short,* M. D., B. S., B. Sc., F. R. C. S. 70th year. 444 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1952.

Introduction to Physiological Optics, by *Armin Von Tschermak-Seysenegg,* University of Munich, Regensburg Extension, Formerly of the University of Prague. Translation Sponsored by *The American Committee on Optics and Visual Physiology Of the Section on Ophthalmology, American Medical Association, American Ophthalmological Society,* and *American Academy of Ophthalmology and Otolaryngology.* Translated by *Paul Boeder,* Ph. D., Director, Bureau of Visual Science, American Optical Company; Instructor in Ophthalmology, Harvard Medical School. 299 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $10.50.

Body Temperature, Its Changes with Environment, Disease and Therapy, by *W. A. Selle,* Ph. D., Professor of Biophysics and Physiology, University of California Medical School, Los Angeles, Calif. American Lecture Series, Publication Number 147, A Monograph in American Lectures in Physical Medicine. Edited by *W. A. Selle,* Ph. D., Professor of Biophysics and Physiology, University of California Medical School, Los Angeles, Calif.; Formerly, Professor of Medical Physics and Director of Postgraduate Courses in Physical Medicine, University of Texas Medical Branch, Galveston, Tex. 112 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952.

Principles of Hospital Administration, by *John R. McGibony,* M. D., Medical Director; Chief, Division of Medical and Hospital Resources, Bureau of Medical Services, U. S. Public Health Service; American Board of Preventive Medicine and Public Health; Fellow American Medical Association; American Hospital Association; Fellow American Public Health Association; American Association for Advancement of Science. 540 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1952.

Medical Biographies, The Ailments of Thirty-three Famous Persons, by *Philip Marshall Dale,* M. D. 259 pages; illustrated. University of Oklahoma Press, Norman, Okla., publishers, 1952. Price $4.

Diseases of the Esophagus, by *Philip Thorek,* M. D., F. A. C. S., F. I. C. S., Associate Clinical Professor of Surgery (Formerly assigned to Gross and Topographic Anatomy), University of Illinois College of Medicine; Diplomate of the American Board of Surgery; Professor of Esophageal Diseases and Clinical Surgery, Cook County Graduate School of Medicine; Member of the American Association of Anatomists; Fellow, American College of Chest Physicians; Co-Surgeon in Chief of the American Hospital; Attending Surgeon of the Cook County Hospital; Senior Attending Surgeon of the Alexian Brothers' Hospital; Author of Text, "Anatomy in Surgery." Drawings by *Carl T. Linden,* Assistant Professor of Medical Illustration, University of Illinois College of Medicine, Chicago. 140 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1952.

Evolution and Human Destiny, by *Fred Kohler.* 120 pages. Philosophical Library, New York, N. Y., publishers, 1952. Price $2.75.

Metabolic Interrelations, With Special Reference to Calcium, Transactions of the Fourth Conference, January 7-8, 1952. New York, N. Y., edited by *Edward C. Reifenstein,* Jr., M. D., Director, Oklahoma Medical Research Institute and Hospital, Oklahoma City, Okla. Editorial assistant, *Shirley L. Wells,* M. S. Sponsored by *Josiah Macy, Jr. Foundation.* 262 pages; illustrated. Printed by Progress Associates, Inc., Caldwell, N. J., 1952. Price $4.50.

The Pharmacology of Anesthetic Drugs, A Syllabus for Students and Clinicians, by *John Adriani,* M. D., Director, Department of Anesthesiology, Charity Hospital, New Orleans, La.; Professor of Surgery, Tulane University School of Medicine; Associate Clinical Professor of Surgery, Louisiana State University School of Medicine. 3d edition, revised. 179 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $9.50.

Functional Neuroanatomy, by *Wendell J. S. Krieg,* B. S. in Med., Ph. D., Professor of Anatomy; Formerly Professor of Neurology and Director of the Institute of Neurology, Northwestern University Medical School. 2d edition, revised and augmented. 659 pages; illustrated. The Blakiston Company Inc., New York, N. Y., publishers, 1953. Price $9.

BRUCELLOSIS

Advances in Therapy

WALTER M. SIMPSON, *Captain, MC, USNR (Ret.)* (1)

THE advent of the newer antibiotics, notably chloramphenicol, aureomycin, and terramycin, has revolutionized the current therapy of brucellosis. Although the outlook for patients suffering from either the acute or chronic manifestations of the disease has improved enormously since the introduction of these antibiotics, the published reports of the responses to such therapy run the gamut from great enthusiasm to excessive skepticism. Sufficient reliable data are now available, however, to eliminate the long-prevalent defeatist attitude on the part of a few writers toward all therapeutic measures against brucellosis.

Before analyzing briefly the relative merits of the agents currently used, it should be emphasized that prophylaxis is still the primary consideration. Cows which harbor brucella and eliminate them in enormous numbers in their milk, feces, and vaginal discharges, often exhibit no superficial manifestations of active brucellosis, such as mastitis, abortion, sterility, and lessened milk yield. Hence there is but one logical method for preventing the transmission of milk-borne brucellosis to human beings, and that is by pasteurization. Brucellosis ranks first among the diseases transmitted to man through the use of raw milk and other unpasteurized dairy products. Murray et al. (2), Boak and Carpenter (3), and Zwick and Wedeman (4) have demonstrated that complete controlled pasteurization will destroy brucella. The necessity for strict supervision of the pasteurization process is apparent.

For those who live on farms, or in communities in which universal pasteurization of all milk and milk products is not yet mandatory, home pasteurization provides a simple, practical and reliable method for preventing the transmission of milk-borne infection to human beings, or to farm animals to which raw milk residues are commonly fed. The large mail-order houses now supply approved home pasteurizers for operation with or without

---

(1) Laguna Beach, Calif.

(2) Murray, C.; McNutt, S. H.; and Purwin, P.: Effects of pasteurization upon Brucella melitensis var. suis. J. Am. Vet. M. A. 33: 336, 1932.

(3) Boak, R., and Carpenter, C. M.: Thermal death point of Brucella abortus in milk. J. Infect. Dis. 43: 327-329, Oct. 1928.

(4) Zwick and Wedeman: Cited in footnote reference (3).

electricity. The vast extension of electrification into rural areas since 1935 has made feasible the use of automatic, thermostatically-controlled, electric, home pasteurizers *(5–7)*. The Standard Milk Ordinance of the U. S. Public Health Service *(8, 9)* was operative on a statewide basis in only 11 States and in the territories of Alaska and Hawaii in 1951. All consumers of raw milk are advised to pasteurize it at home as a health precaution.

If an approved automatic, electric, home pasteurizer is not available, the following simple methods for pasteurization in the home, on ranches, or farms, or by isolated military personnel are recommended: "(1) After the water in the bottom of a double boiler has been brought to a vigorous boil, place the inner container with milk in the outer container, cover it, and continue to apply the same heat for 10 minutes; or (2) heat the milk in an open saucepan over a hot flame, to 165° F., stirring constantly, then immediately place the vessel in cold water and continue stirring until cool, changing the water when it warms up; however, if a dependable thermometer is not available, bring the milk to a boil instead * * *. The simplest method for satisfactorily heating milk in the home to make it safe for consumption as fluid milk is by the double-boiler method described above under (1)." *(10)*

For the artificial feeding of infants, the traditional practice of boiling cow's milk to fragment and to soften the comparatively tougher bovine milk curd fortunately also provides the additional safety factor of destroying all bacteria contained in the milk. Similar dual benefits are derived from the use of canned evaporated or powdered milk. The simplest and safest preventive measure against milk-borne infections for campers, travelers, or military personnel operating in primitive areas is to bring cow's or goat's milk, obtained locally, to the boiling point in a metal vessel, followed by quick cooling. The use of tinned powdered or evaporated milk, or frozen pasteurized milk, also provides complete protection.

---

(5) Thomas, R. C.: Operation studies of home milk pasteurizers. Pub. Health Rep. 64: 1411-1422, Nov. 11, 1949.

(6) Thomas, R. C.: A Study of the Operation of a Home Milk Pasteurizer (mimeographed report). Environmental Health Center, Public Health Service, Cincinnati, Ohio, March 1947.

(7) Trout, G. M., and Bortrea, A. L.: Laboratory pasteurization studies on home electric milk pasteurizers. Mich. Agric. Exper. Station Quart. Bull. 30: 64, Aug. 1947.

(8) Division of Sanitation, Milk and Food Branch, Public Health Service: Communities awarded milk sanitation ratings of 90 percent or more during 1949 and 1950. Pub. Health Rep. 66: 239-243, Feb. 23, 1951.

(9) Model milk regulations. (Government Services: Public Health Service) J. A. M. A. 145: 338, Feb. 3, 1951.

(10) Pasteurizing Milk at Home. University of Minnesota Agriculture Extension Service, U. S. Department of Agriculture, Extension Folder 133, June 1945.

BRUCELLA ANTIGEN THERAPY

Although the use of chloramphenicol, aureomycin, terramycin, and dihydrostreptomycin has greatly enhanced the outlook for most patients suffering from either acute or chronic brucellosis, it is difficult to evaluate the effectiveness of any form of therapy when the natural course of the disease is characterized by natural remissions and by wide swings in its individualized symptomatology.

Undulant fever vaccine obtained from *Brucella abortus* and *Brucella suis* has been widely used. Vaccines prepared from *Brucella melitensis* should be used only in the relatively rare infections with this variety.

Despite the indispensability of the newer antibiotics, they will not control either acute or chronic brucellosis when used alone. Harris *(11)*, Foshay *(12)*, Huddleson and Johnson *(13, 14)*, Simpson *(15–20)*, and others are convinced that brucella antigens (undulant fever vaccine, Huddleson's brucellin *(13, 14, 21)*, Harris's *Br. abortus* bacterin, Castaneda's M. B. P. vaccine, or Hoffman's B. A. C. vaccine) should be used as an adjuvant in treating chronic brucellosis when the responses to the available antibiotic or chemotherapeutic agencies are disappointing, or relapses follow such therapy administered in presumably adequate doses.

No rigidly standardized dosage scheme for undulant fever vaccine therapy is applicable to all patients with this disease.

---

(11) Harris, H. J.: Addenda on antibiotic therapy. In Brucellosis (Undulant Fever), Clinical and Subclinical. 2d edition. Paul B. Hoeber, Inc., New York, N. Y., 1950. pp. 531-544.

(12) Foshay, L.: Brucellosis. In Barr, D. P.: Modern Medical Therapy in General Practice, Vol. 3. Williams & Wilkins Co., Baltimore, Md., 1940.

(13) Huddleson, I. F., and Johnson, H. W.: "Brucellin," possible specific for undulant fever in man; preliminary report. Am. J. Trop. Med. 13: 485-504, Sept. 1933.

(14) Huddleson, I. F., and Johnson, H. W.: Brucellosis: Causes, Sources of Infection, Clinical Diagnosis, Laboratory Diagnosis, Treatment. Bull., Central Brucella Station, Michigan State College, 1938.

(15) Simpson, W. M., and Fraizer, E.: Undulant fever; report of 63 cases occurring in and about Dayton, Ohio. J. A. M. A. 93: 1958-1963, Dec. 21, 1929.

(16) Simpson, W. M.: Undulant fever; report of 33 cases occurring in and about Dayton, Ohio. Veterinary Alumni Quarterly, Ohio State University 17: 112-119, 1929.

(17) Simpson, W. M.: Undulant fever (brucelliasis); clinicopathologic study of 90 cases occurring in and about Dayton, Ohio. Ann. Int. Med. 4: 238-259, Sept. 1930.

(18) Simpson, W. M.: Clinical picture of undulant fever. Ohio State M. J. 27: 21-27, Jan. 1931.

(19) Simpson, W. M.: Undulant fever (brucelliasis), with special reference to 128 cases in and about Dayton, Ohio. U. S. Nav. M. Bull. 29: 581-591, Oct. 1931.

(20) Simpson, W. M.: Brucellosis (undulant fever). Ohio State M. J. 36: 1053-1060, Oct. 1940.

(21) Huddleson, I. F.; Johnson, H. W.; and Beattie, C. P.: Studies in Brucella Infection; report of 100 cases treated with brucellin. Bulletin 149, Agriculture Experimental Station, Michigan State College, May 1936.

242918 O - 53 - 3

Experience and good judgment are essential in determining the proper dosage and the optimum treatment intervals for each patient. The procedure usually employed with undulant fever vaccines is to test for hypersensitiveness by injecting 0.05 cc. of a 1:10 dilution of the vaccine intracutaneously. If the patient does *not* show an excessive local or systemic reaction within the next 48 hours, an initial therapeutic dose of 0.25 cc. is injected deeply into the subcutaneous tissues, or intramuscularly. Local reactions are minimized by intramuscular injections. If no untoward reactions follow the first injection, 0.25 cc. is usually given 3 days later. Ordinarily a third and fourth dose of 0.5 cc., a fifth and sixth dose of 0.75 cc., and from 5 to 8 injections of 1 cc. are then given at 3-day intervals.

If the patient is exquisitely sensitive, it is wise to begin with intramuscular doses of 0.1 cc., or, in rare cases, with doses of 0.1 cc. of a 1:10 or 1:100 dilution of the vaccine, gradually increasing the dose by increments of 0.1 cc. until a dose of 1 cc. is reached. If, in the course of the injections, an unusually severe local or systemic reaction should occur, the next dose should be reduced to one-half the amount which produced the severe reaction and then gradually increased. Because a series of about 6 sharp systemic reactions, usually accompanied by fever and a transient exacerbation of symptoms, is the goal of the treatment, only extreme local or general reactions should be avoided. Elevations of temperature to from 103 to 105° F. are not uncommon within from 4 to 8 hours after the injection of the vaccine. Such sharp systemic responses may occur following the first injection of small doses of vaccine or may not occur until relatively large doses are given. In chronic brucellosis, larger doses of the vaccine may be required. If no reaction is provoked after 5 or 6 injections of 1 cc., the dose may be increased gradually by increments of 0.5 cc. to 2 or 3 cc.

Although a few patients who have obtained an apparently satisfactory response to vaccine therapy have had little or no febrile, systemic reaction, the most prompt and lasting results have occurred in those who have had several such reactions. Erythema and tenderness at the site of vaccination occur commonly for 1 or 2 days following injection. In about 5 percent of patients, a local hard tumefaction may persist much longer. In a small proportion of such patients sterile abscesses or areas of focal necrosis have developed at the site of injection.

Brucellin is a fraction of brucella cells obtained by growing the organism in liver broth. The bacteria-free, active agent is recovered from the liver broth filtrate. The dose must be adjusted to the requirements of the patient. After the extent of sensitiveness has been determined by the intradermal injection of 0.1 cc.,

the usual procedure in nonhypersensitive patients is to give repeated injections of 1 cc. at 3-day intervals until the morning and evening temperature between injections tends to become subnormal. As with undulant fever vaccine therapy, one objective of this form of therapy is to induce a series of 4 or more febrile, systemic reactions. If the duration of illness is less than 10 weeks, the likelihood of a prompt and satisfactory response following 4 injections of 1 cc. is greater than in cases of longer duration. Patients with long-continued, chronic brucellosis require a larger number of injections and may benefit by gradually increasing amounts up to 5 cc. before satisfactory systemic reactions are provoked. In highly sensitized persons, it is advisable to start with intramuscular doses of 0.1 cc. If there is no severe systemic reaction following this injection, each succeeding dose may ordinarily be doubled, until the larger dosage is attained.

In children, the initial dose of undulant fever vaccine or brucellin should not exceed 0.1 cc., and succeeding doses should be increased by increments of not over 0.1 cc. High dilution of the vaccine is also mandatory for hypersensitive children.

The contraindications to brucella antigen therapy are the coexistence of active cardiac or renal disease, advanced arteriosclerosis, meningeal or cerebral localizations of brucella, or the acute fulminating form of the disease.

CHEMOTHERAPY

Neoarsphenamine, merbromin, acriflavine, nitromersol, thionine, methylene blue, methyl violet, gentian violet, and other chemical substances have been used in the treatment of brucellosis. In most instances the reports of the apparently successful use of these substances were based on observations restricted to small numbers of patients observed over short intervals. The very length of the list argues against the specificity of any of them.

Beginning with sulfanilamide, the rapid succession of other sulfonamides has been greeted with nihilism or varying degrees of enthusiasm *(22)*. Following the first waves of enthusiastic reception, usually based on brief periods of observation of relatively few patients, subsequent reports of less favorable or entirely negative results appeared. Blumgart and Gilligan *(23)* analyzed the results reported in 31 articles which appeared between 1936 and 1939; 24 of the reports were concerned with only 1 or 2 patients. Of the 74 patients treated with various sulfonamides, there were 68 apparent recoveries and 6 failures.

(22) Gaffney, M.: Report on 5 cases of Brucella abortus infection. Brit. M. J. 2: 885-887, Oct. 29, 1938.

(23) Blumgart, H. L., and Gilligan, D. R.: Treatment of undulant fever with sulfanilamide and related compounds. M. Clin. North America 23: 1193-1203, Sept. 1939.

Fourteen of the 68 patients (20 percent) relapsed. Bynum *(24)* reported 6 patients with brucellosis treated unsuccessfully with large doses of a sulfonamide. Long and Bliss *(25)* reported recurrences of infection in 4 of 5 patients whose immediate responses to sulfonamide therapy were apparently satisfactory; in 2, brucella were recovered from the blood after sulfonamide therapy was discontinued.

Of the various sulfonamides tried in the treatment of brucellosis only sulfadiazine is still used. When used alone, it is relatively ineffective, but when employed conjointly with streptomycin or, preferably, with dihydrostreptomycin, the effect exceeds that of either alone.

The combined streptomycin-sulfadiazine treatment was introduced into the therapy of brucellosis concurrently (1947) by Eisele and McCullough *(26)* and by Pulaski and Amspacher *(27)*. The wave of reports *(28–33)* between 1947 and 1950 of successful results achieved with this combination left little doubt of its efficacy. Dihydrostreptomycin soon replaced streptomycin in this combination because it caused fewer undesirable side effects, such as deafness. By 1950, however, the combined dihydrostreptomycin-sulfadiazine therapy had practically fallen into disuse because of disabling and often permanent neurologic complications and because of the superiority of aureomycin, chloramphenicol, and terramycin. In certain patients with chronic brucellosis, however, in whom a full exhibition of antibiotic therapy, with or without concomitant antigenic therapy, has not yielded satisfactory results, a course of combined sulfadiazine-dihydrostreptomycin therapy is justified.

---

(24) Bynum, W. T.: Recurrences of undulant fever (brucellosis) following administration of sulfanilamide. J. A. M. A. 112: 835-836, Mar. 4, 1939.

(25) Long, P. H., and Bliss, E. A.: Clinical and Experimental Use of Sulfanilamide, Sulfapyridine, and Allied Compounds. Macmillan Co., New York, N. Y., 1939. p. 209.

(26) Eisele, C. W., and McCullough, N. B.: Combined streptomycin and sulfadiazine treatment in brucellosis. J. A. M. A. 135: 1053-1055, Dec. 20, 1947.

(27) Pulaski, E. J., and Amspacher, W. H.: Streptomycin therapy in brucellosis. Bull. U. S. Army M. Dept. 7: 221-225, Feb. 1947.

(28) Harris, H. J., and Jett, P. C.: Streptomycin and sulfadiazine (combined) in chronic brucellosis. J. A. M. A. 137: 363-364, May 22, 1948.

(29) Doolittle, S. E.: Brucellosis: Treatment with streptomycin and sulfadiazine. Proc. Staff Meet. Clin., Honolulu 15: 1, 1949.

(30) Spink, W. W.; Hall, W. H.; Shaffer, J. M.; and Braude, A. I.: Human brucellosis; its specific treatment with combination of streptomycin and sulfadiazine. J. A. M. A. 136: 382-387, Feb. 7, 1948.

(31) Herrell, W. E., and Nichols, D. R.: Combined use of streptomycin and sulfadiazine in treatment of brucellosis. M. Clin. North America 33: 1079-1088, July 1949.

(32) Heilman, F. R.: The effect of combined treatment aureomycin and dihydrostreptomycin on Brucella infections in mice. Proc. Staff Meet., Mayo Clin. 24: 133, 1949.

(33) Scowen, E. F., and Garrod, L. P.: The streptomycin-sulphadiazine treatment of undulant fever. Brit. M. J. 2: 1099, 1948.

ANTIBIOTIC THERAPY

The early reports of results achieved with aureomycin, chloramphenicol, and terramycin were unduly enthusiastic. More recent reports reveal that these antibiotics often suppress rather than cure the disease, particularly when inadequate doses are given over too short a period *(34)*. Although the breadth of the therapeutic spectrum varies somewhat, as regards the number and kind of micro-organisms favorably influenced by these 3 antibiotics, their therapeutic effectiveness in both the acute and chronic manifestations of brucellosis is essentially similar. The relative cost and the absence or frequency of troublesome side effects should determine the choice of antibiotic to be used on any patient.

Fleming *(35)* stated that the indications for using these antibiotics overlap one another, and that each exerts comparable action on pyogenic cocci, gram-negative bacilli of the colityphoid group, brucella, the rickettsias, and some viruses, and that all 3 exert a rapidly specific destructive effect on intestinal micro-organisms. Within 24 hours following the oral administration of any one of them, cultures made from feces usually contain only some mycetes. This sudden shift in the intestinal flora accounts for the ascendancy of mycetes over bacteria and for the frequent development of mycotic invasions of the mucosa of the vagina, vulva, rectum, anus, mouth, tongue, pharynx, and contiguous moist skin surfaces. Harris *(36)* and Behrman *(37)* recovered pure cultures of *Candida albicans* from vaginal and perianal exudates in patients who had pruritus vulvae and/or pruritus ani after receiving either aureomycin or chloramphenicol. The use of fungicides produced prompt resolution of the mycotic lesions. Such distressing side effects apparently occurred less frequently in patients treated with chloramphenicol or terramycin than in those for whom aureomycin was prescribed. Similarly, the oral administration of chloramphenicol or terramycin is attended by fewer and less severe gastrointestinal disturbances, such as anorexia, epigastric pain, nausea, vomiting, and diarrhea. Deficiencies in the absorption of components of the vitamin B complex induced by these 3 antibiotics also contribute to the complication of moniliasis.

---

(34) Killough, J. H.; Magill, G. B.; and Smith, R. C.: Terramycin, chloramphenicol, and aureomycin in acute brucellosis; preliminary report. J. A. M. A. 145: 553-555, Feb. 24, 1951.

(35) Fleming, A.: Cited in Reports by Drs. D. Gottlieb and Perrin H. Long (U. S. A.) at the Second Italian Congress on Antibiotics. (Foreign Letters) J. A. M. A. 143: 1443, Aug. 19, 1950.

(36) Harris, H. J.: Aureomycin and chloramphenicol in brucellosis; with special reference to side effects. J. A. M. A. 142: 161-165, Jan. 21, 1950.

(37) Behrman, H. T.: Pruritus vulvae due to aureomycin. J. A. M. A. 144: 995, Nov. 18, 1950.

In the search for substances which would counteract the irritative gastrointestinal effects of aureomycin, aluminium hydroxide gels administered simultaneously with aureomycin were found to prevent nausea and vomiting. It was soon learned, however, that such alkaline gels impair or prevent the absorption of aureomycin from the stomach or intestine. This dilemma has been resolved by Bartholomew and Nichols *(38)* who observed that 200 cc. of milk drunk at the time the aureomycin capsules were swallowed prevented nausea and vomiting in 92 percent of patients thus tested. They found also that the simultaneous ingestion of milk with aureomycin did not inhibit absorption of aureomycin in the gastrointestinal tract. This simple procedure has eliminated most of the objections formerly raised by both patients and physicians to the oral administration of aureomycin. Similarly, the simultaneous ingestion of milk with capsules of chloramphenicol or terramycin will usually prevent nausea and vomiting in those few patients who have gastrointestinal sensitivity to these antibiotics.

The dosages recommended for aureomycin, chloramphenicol, and terramycin have varied widely since these antibiotics were first introduced. Further experience has revealed that the dosages then employed were excessive, with resultant side effects, which have been largely eliminated by a better understanding of the attainment of effective serum levels with lesser quantities of the drugs. All 3 antibiotics are highly effective when administered orally in proper doses. For patients with severe manifestations of acute brucellosis, in whom prompt relief is essential, any of these antibiotics may be given intravenously.

Aureomycin hydrochloride in concentrations of from 2 to 4 micrograms per 100 cc. in the patient's serum may be obtained 12 hours after the intravenous administration of 0.5 gram of the drug in 250 cc. of physiologic saline solution. Preferably, a No. 17 or 18 needle is used for such injection to insure a flow of at least 30 cc. per minute. Doses of 0.75 and 1 gram give effective concentrations for from 18 to 24 hours, respectively, but the 18-hour schedule is inconvenient to both the patient and the physician, and the larger amount often produces toxic side reactions, such as fever, chills, nausea, vomiting, and backache. Such reactions are usually prevented when the recommended smaller doses are given *(39)*.

The currently recommended dosage of aureomycin for patients with *acute* brucellosis, when given in capsules by mouth, is

(38) Bartholomew, L. G., and Nichols, D. R.: Use of milk to control vomiting caused by aureomycin. Proc. Staff Meet., Mayo Clin. 25: 370-373, June 21, 1950.

(39) Randall, R. V.; Taylor, R. W.; and Wellman, W. E.: Intravenous administration of aureomycin including studies on concentration in serum. Proc. Staff. Meet., Mayo Clin. 24: 605-611, Dec. 7, 1949.

25 mg. per kg. of body weight every 24 hours, divided into 4 equal doses; for adults of average weight, the usual dose is 500 mg. every 6 hours. This should be continued for 1 or 2 days beyond the time when the fever and other signs and symptoms have receded. Patients with severe acute infections who do not respond satisfactorily within 48 hours should be given 500 mg. or more every 3 hours. The optimum treatment schedule with orally administered aureomycin has not been definitely established for patients suffering from low-grade chronic brucellosis. In such patients, the preliminary oral administration of from 250 to 500 mg. daily for 2 or 3 days may be desirable, followed by progressively increased amounts of aureomycin up to the more standardized doses employed in patients with acute brucellosis.

The prompt and dramatic therapeutic effects following the oral use of aureomycin noted by Spink et al. *(40)* in 24 patients acutely ill with brucellosis caused by *Br. melitensis* are in contrast to the failures encountered by Green and Stein *(41)* following a similar therapeutic program in 3 patients, all of whom were laboratory workers accidentally infected with *Br. suis*. In these 3 patients with acute brucellosis, aureomycin exerted only a temporary suppressive effect and was of little or no value in preventing clinical and bacteremic relapses. This striking difference in the response of brucellosis due to *Br. melitensis* and that caused by *Br. suis* following apparently adequate doses of aureomycin would appear to indicate that the relative degree of pathogenicity of the 3 varieties of brucella may have a significant bearing on the therapeutic effectiveness of the currently available antibiotics. All 3 of the newer antibiotics apparently exert a more uniformly favorable effect on acute brucellosis caused by *Br. abortus*. Despite the rapidly favorable immediate clinical responses to the 3 newer antibiotics, an analysis of successive reports *(36, 40, 42–51)* reveals clinical relapse rates ranging up to 22 percent.

---

(40) Spink, W. W.; Braude, A. I.; Castaneda, M. R.; and Sylva-Goytia, R.: Aureomycin therapy in human brucellosis due to Brucella melitensis. J. A. M. A. 138: 1145-1148, Dec. 18, 1948.

(41) Green, T. W., and Stein, L.: Failures with aureomycin in treatment of infection with Brucella suis; report of 3 cases. J. A. M. A. 144: 380-382, Sept. 30, 1950.

(42) Harris, H. J.: Brucellosis (Undulant Fever), Clinical and Subclinical. 2d edition. Paul B. Hoeber, Inc., New York, N. Y., 1950.

(43) Braude, A. I.; Hall, W. H.; and Spink, W. W.: Aureomycin therapy in human brucellosis due to Brucella abortus. J. A. M. A. 141: 831-835, Nov. 19, 1949.

(44) Bryer, M. S.; Schoenbach, E. B.; Wood, R. H.; and Long, P. H.: Treatment of acute brucellosis with aureomycin. Bull. Johns Hopkins Hosp. 84: 444-460, May 1949.

(45) Harris, H. J.: Aureomycin and chloromycetin in brucellosis, with special reference to chronic brucellosis. Bull. New York Acad. Med. 25: 458, July 1949.

(46) Ralston, R. J., and Payne, E. H.: Treatment of chronic brucellosis with chloramphenicol and aureomycin. J. A. M. A. 142: 159-161, Jan. 21, 1950.

Perhaps the most significant controlled comparison of the therapeutic effects achieved with the dosages then recommended for terramycin, chloramphenicol, and aureomycin was reported by Killough et al. *(34)*. Of 39 patients acutely ill with brucellosis, 16 were treated with terramycin hydrochloride, 12 with chloramphenicol, and 11 with aureomycin hydrochloride. The immediate clinical responses were uniformly excellent with each of these antibiotics, and from this viewpoint no advantages of any one antibiotic over another were observed. As regards patient acceptability, terramycin and chloramphenicol were preferred. No significant differences were observed in either the clinical or the bacterial relapse rates with the 3 drugs, but the significantly high combined clinical-bacterial relapse rate of 69 percent led these investigators to conclude that these 3 agents suppress rather than cure brucellosis when given in the currently recommended doses.

As with aureomycin therapy, the dosage schedules for chloramphenicol and terramycin remain in an unsettled state. Furthermore, the doses required by a given patient with either acute or chronic brucellosis will vary widely, depending on the severity of the infection and the relative tolerance of the patient for the selected antibiotic or combination of antibiotics. The printed dosage schedules accompanying the original packages should be consulted by the physician in determining a point of departure for the initial dose. Additions to or subtractions from such doses may then be made to meet the requirements of individual patients. By the same token, recognition should be given to the fact that a temporary remission is not a cure and that relapses will demand further adjustments of dosage schedules, both as regards the amount and the duration of therapy to prevent recurrence.

In 1952 a succession of reports *(52–57)* revealed that the prolonged administration of chloramphenicol may have been a

(47) Woodward, T. E.: Chloromycetin and aureomycin; therapeutic results. Ann. Int. Med. 31: 53-82, July 1949.

(48) Galpine, J. F.: Case of abortus infection treated with "aureomycin." Brit. M. J. 1: 1037-1038, June 11, 1949.

(49) Rose, H. M., and Kneeland, Y., Jr.: Aureomycin in treatment of infectious diseases. Am. J. Med. 7: 532-541, Oct. 1949.

(50) Walley, J. F. L., and Cooper, T. V.: Case of undulant fever treated by chloramphenicol. Brit. M. J. 2: 265-266, July 30, 1949.

(51) Woodward, T. E.; Smadel, J. E.; Holbrook, W. A., Jr.; and Raby, W. T.: Symposium on antibiotics; beneficial effect of chloromycetin in brucellosis. J. Clin. Investigation 28: 968-976, Sept. 1949.

(52) Claudon, D. B., and Holbrook, A. A.: Fatal aplastic anemia associated with chloramphenicol (chloromycetin) therapy; report of 2 cases. J. A. M. A. 149: 912-914, July 5, 1952.

(53) Smiley, R. K.; Cartwright, G. E.; and Wintrobe, M. M.: Fatal aplastic anemia following chloramphenicol (chloromycetin) administration. J. A. M. A. 149: 914-918, July 5, 1952.

contributing factor in several deaths from aplastic anemia. The possibility that other broad-spectrum antibiotics may also act occasionally as bone marrow depressants is being studied. In most instances in which fatal aplastic anemia occurred, chloramphenicol was given over long periods. In other nonfatal cases, granulocytopenia, neutropenia, and epistaxis occurred. Prompt recovery was the rule when the antibiotic was discontinued and appropriate supportive therapy was instituted. The fact that chloramphenicol has been given to thousands of patients throughout the world with unquestionably favorable effects for several years without such hematopoietic depression would indicate individual sensitization, undue prolongation of therapy, and a cumulative effect of the drug. All investigators agree that these discoveries make it mandatory that careful evaluation be made of the blood status of all patients to whom chloramphenicol and similar antibiotics are given, and "that biweekly blood counts be done and the drug promptly discontinued where early signs of bone marrow injury are discovered; that the use of the drug should be limited to infections that in themselves or by their complications endanger the life of the patient and in which such antibiotic therapy has proved effective." *(55)*

The treatment of patients with chronic brucellosis differs from the treatment of those with acute brucellosis. The extraordinary latency of chronic brucellosis and the greater likelihood of relapses following apparent recovery place such patients in much the same category as those suffering from chronic tuberculosis. The comparable quasi-symbiotic parasitism of brucella and of *Mycobacterium tuberculosis* in living body cells explains the difficulties encountered in dislodging and destroying such micro-organisms with any available drug. Hence, the expectations from any form of therapy for chronic brucellosis will be uncertain until new and more highly specific agents, or combinations of agents, are introduced into chronic brucellosis therapy.

Harris *(36, 45)* has had more encouraging results in the treatment of chronic brucellosis with chloramphenicol or aureomycin than with any pre-existing agents. Fifty-five patients with long-continued chronic brucellosis received aureomycin by mouth; more than one course of aureomycin therapy was required by

(54) Sturgeon, P.: Fatal aplastic anemia in children following chloramphenicol (chloromycetin) therapy; report of 4 cases. J. A. M. A. 149: 918-922, July 5, 1952.

(55) Marshall, L. B. (editor): Administration of chloramphenicol. Med. News Letter 20: 2, Aug. 8, 1952.

(56) Hargraves, M. M.; Mills, S. D.; and Heck, F. J.: Aplastic anemia associated with administration of chloramphenicol. Proc. Staff Meet., Mayo Clin. 27: 280-281, July 16, 1952.

(57) Lawrence, J. S.; Adams, W. S.; and Valentine, W. N.: White blood cell changes in clinical disorders. J. A. M. A. 150: 454-460, Oct. 4, 1952.

23 patients; 49 (89 percent) recovered partially or completely during periods of observation extending from 1 to 6 months. A total of 25 grams of chloramphenicol was given by Harris to 14 patients similarly affected with chronic brucellosis. They were observed closely for from 1 to 4 months; 3 required one or more additional courses of the drug; partial to complete recovery occurred in 11 (78.5 percent). Ralston and Payne *(46)* achieved practically identical results following either chloramphenicol or aureomycin therapy in 66 patients with chronic brucellosis.

SYNERGISTIC ACTION OF COMBINED CHEMO-ANTIBIOTIC THERAPY

The most recently published reports *(58–60)* on the therapy of either acute or chronic brucellosis indicate that the synergistic effects produced by various combinations of antibiotic, chemotherapeutic, and/or antigenic agents provide much greater promise of curing the disease than have been achieved with any such substances used alone. The earlier demonstrations of the more effective synergistic effects produced when streptomycin or dihydrostreptomycin was combined with sulfadiazine led Herrell and Barber *(61, 62)* and Heilman *(32)* to experiment with the combined use of aureomycin and dihydrostreptomycin, first in laboratory animals and then in patients with brucella infections. For patients, Herrell and Barber used 3 grams of aureomycin and 2 grams of dihydrostreptomycin daily for 14 days. The promptly favorable therapeutic effects exceeded those previously obtained with any other available compounds. Equally favorable results following combined terramycin-dihydrostreptomycin therapy were reported by Herrell and Barber in 1952. Rosenbaum and Reveno *(63)* also found the combination of aureomycin and dihydrostreptomycin administered simultaneously to be superior to any form of therapy previously tried. After obtaining promising results from in vitro laboratory studies with the combination of sulfadiazine, dihydrostreptomycin, and aureomycin, Eisele and McCullough *(64)* used these 3 drugs concurrently in 12 patients with cul-

(58) Werner, C. A., and Knight, V.: Suppressive effect of antimicrobial drugs on Brucella melitensis infection in mice. J. Immunol. 65: 509-514, Nov. 1950.

(59) English, A. R.; Tate, K. B.; and Goulet, P. L.: Synergistic antibiotic combination containing terramycin and one other antibiotic. Proceedings, Fifty-First General Meeting, Society of American Bacteriologists, 1951.

(60) Armstrong, C. W. J., and Larner, A. E.: Effect of combinations of antibiotics on Pseudomonas aeruginosa and on Proteus vulgaris, in vitro and in vivo. J. Lab. & Clin. Med. 37: 584-592, Apr. 1951.

(61) Herrell, W. E., and Barber, T. E.: Combined use of aureomycin and dihydrostreptomycin in treatment of brucellosis. Proc. Staff Meet., Mayo Clin. 24: 138, 1949.

(62) Herrell, W. E., and Barber, T. E.: New method for treatment of brucellosis. J. A. M. A. 144: 519-524, Oct. 14, 1950.

(63) Rosenbaum, H., and Reveno, W. S.: Treatment of brucellosis with combined aureomycin and dihydrostreptomycin. Harper Hosp. Bull. 8: 1-4, Jan.-Feb. 1950.

(64) Eisele, C. W., and McCullough, N. B.: Treatment of brucellosis. Illinois M. J. 96: 241-244, Oct. 1949.

turally-proved brucellosis with highly encouraging results. All of these patients had failed to respond previously to courses of chloramphenicol, aureomycin, and combined streptomycin-sulfadiazine. None of them had either a clinical or bacteriologic relapse during 3 years of continuous post-treatment observation. Carle developed a well-standardized experimental technic for evaluating therapeutic procedures against brucellosis in experimentally-infected laboratory animals. He found the Eisele-McCullough triple antibiotic combination to be far superior to any other combined treatment used.

Encouraging experimental studies of brucella-infected laboratory animals and also of patients with brucellosis treated by combining streptomycin (or dihydrostreptomycin) with terramycin or chloramphenicol are in progress. Many investigators are engaged in testing the curative effects of newly discovered antibiotics combined with chemotherapeutic agents with or without brucella antigens. Happily, the synergistic actions of various combinations of drugs against the 3 varieties of brucella are being investigated in many parts of the world. As a result, there is a definite trend toward the use of combinations of compounds which will produce cure, without undesirable side effects rather than remission.

Janbon and Bertrand *(65)* noted immediate and favorable responses to aureomycin in 50 patients with either acute or chronic brucellosis. All were observed at frequent intervals for at least 6 months following aureomycin therapy. An apparently lasting clinical recovery occurred in 85 percent; in the rest, a clinical relapse occurred in from 15 days to 3 months after the discontinuance of aureomycin. These authors stressed their more uniformly successful results when undulant fever vaccine was used in conjunction with aureomycin. Bassi and Menci *(66)* found that the concomitant use of anti-brucella vaccine therapy with either aureomycin or chloramphenicol diminished the quantities of antibiotic required for curative effects and produced more lasting immunity.

(65) Janbon, M., and Bertrand, L.: Cited in treatment of brucellosis with aureomycin. (Foreign Letters) J. A. M. A. 145: 1287, Apr. 21, 1951.

(66) Bassi, M., and Menci, S.: Therapy of brucellosis. Settimana Medica, Florence. 38: 566, Nov. 30, 1950. (Medical Literature Abstracts) J. A. M. A. 146: 1171, July 21, 1951.

ARTICLES BY PERSONNEL OF THE MEDICAL SERVICES OF THE ARMED FORCES PUBLISHED IN OTHER JOURNALS

Bracher, A. N., Col., MC, USA, and Koontz, A. R.: Mediastinal bronchogenic cyst and Klippelfeil syndrome. J. A. M. A. 150: 1006-1009, Nov. 8, 1952.

Chung, R. C. H., and Mantell, L. K., Col., MC, USA: Urographic changes in diabetes; report of case. J. A. M. A. 150: 1307-1308, Nov. 29, 1952.

Gregory, L. J., Capt., MC, USA, and Rider, J. A.: Comparison of therapeutic effects of alkyl phosphates in myasthenia gravis. J. Lab. & Clin. Med. 40: 805, Nov. 1952.

Gregory, L. J., Capt., MC, USA, and Gregory, R. L.: Diseases of parathyroid glands. Texas J. Med. 48: 741-748, Nov. 1952.

Gregory, L. J., Capt., MC, USA; Futch, E. D.; and Stone, C. T.: Octomethyl pyrophosphoramide in therapy of myasthenia gravis. Am. J. Med. 13: 423-427, Oct. 1952.

Homer, L., First Lt., MC, USA, and Donovan, W. N., Lt. Col., MC, USA: Aureomycin in mumps. J. A. M. A. 150: 465-467, Oct. 4, 1952.

Jacobs, G. J.; Cronkite, E. P., Commander, MC, USN; and White, S. G., Maj., USAF: Observations on serum prothrombin conversion accelerator in radiation induced pancytopenia. Am. J. Physiol. 170: 390-395, Aug. 1952.

Katz, S., Capt., MC, USA; Leedham, C. L., Col., MC, USA; and Kessler, W. H., Capt., MC, USA: Medical management of hemorrhagic fever. J. A. M. A. 150: 1363-1366, Dec. 6, 1952.

Kimbrough, J. C., Col., MC, USA, and Morse, W. H., Capt., MC, USA: Subcapsular nephrectomy. Surg., Gynec. & Obst. 96: 235-239, Feb. 1953.

Marshall, M., Jr., Lt., MC, USNR: Management of non-venereal urethritis. Pennsylvania M. J. 55: 1012-1016, Oct. 1952.

Peterson, W. F., Capt., USAF (MC): True knot of umbilical cord resulting in fetal death; report of case. J. A. M. A. 150: 1009-1010, Nov. 8, 1952.

Tempel, C. W., Col., MC, USA: Present status of specific drug treatment of tuberculosis. J. A. M. A. 150: 1165-1170, Nov. 22, 1952.

THE ROLE OF THIAMINE HYDROCHLORIDE IN DENTISTRY

Part III (1)

JAMES L. E. BOCK, *Lieutenant Colonel, USAF (DC) (2)*

PROPHYLACTIC USE OF THIAMINE

THE prophylactic use of thiamine has long been advocated for conditions, such as febrile diseases, hyperthyroidism, pregnancy, and lactation, in which the metabolism is greatly augmented. It is also recommended when it is present in inadequate amounts in the diet or when gastrointestinal disturbances are present that prevent its proper absorption. The general purpose of prophylactic doses is to prevent the occurrence of neurologic and cardiovascular disturbances that are associated with thiamine deficiency. The prophylactic doses range from 1 to 3 mg. by mouth daily. When gastrointestinal disturbances are present and assimilation is impaired, parenteral administration is indicated.

Prevention of pain. Whitfield *(139)* reported the use of thiamine in the prevention of pain in dry sockets. He selected 63 patients who had teeth to be extracted whom he regarded as being likely to develop dry sockets. As a prophylactic measure, he administered 100 mg. of thiamine intramuscularly to each of these patients prior to extraction. Five patients developed dry sockets which necessitated an additional injection of 50 mg. of thiamine for relief of pain. The remaining patients did not develop dry sockets. In 100 control patients who received no prophylactic injection of thiamine, 61 developed dry sockets in from 3 to 5 days after extraction. Although these observations suggest that thiamine may be useful in the prevention of dry sockets, this type of evidence is difficult to evaluate. It cannot be determined whether any of the thiamine-treated patients would have necessarily developed dry sockets had they not been treated with thiamine prior to extraction. In spite of the prophylactic use of the vitamin, 5 of 63 patients developed dry sockets.

(1) Part I appeared in the U. S. Armed Forces Medical Journal, vol. 4, pp. 81-97, Jan. 1953 and Part II on pp. 181-196, Feb. 1953.

(2) Bolling Air Force Base, Washington, D. C.

(139) Whitfield, A. J.: Use of thiamin chloride in prevention of pain from dry sockets. J. Am. Dent. A. 28: 450-452, Mar. 1941.

Massive doses of thiamine, parenterally administered, are largely excreted within the first hour, practically all of the remainder being excreted within 24 hours. Because dry sockets do not usually develop until about the fourth day after extraction, it does not appear feasible that a sufficient amount of the thiamine given earlier would still be present to exert a preventive effect. If the purpose of the prophylactic administration of thiamine is to raise and sustain the blood level for a definite period, then repeated oral or parenteral doses for several days would be more efficacious than a single dose.

Case 7. A full-mouth extraction was performed in several sessions on a 24-year-old man because of a severe, periodontal disease. On his first visit, the maxillary left bicuspids and molars were extracted. One week later, he returned to the clinic complaining of pain which had been present since the extractions. The sockets did not resemble true dry sockets but rather a delayed healing process in which there was a lack of granulation tissue and exposure of part of the bony alveolus. One hundred milligrams of thiamine were given intramuscularly with complete relief of pain in 20 minutes. The pain did not return and tissue granulated over the exposed alveolus within a few days. The patient was given 5 mg. of thiamine orally 3 times daily for 4 days prior to his next visit, at which time the posterior teeth in the left mandible were extracted. Healing was slow but no pain was experienced. The posterior teeth in the right mandible were extracted 10 days later without the prophylactic use of thiamine. Postoperative pain and delayed healing resulted. This was promptly relieved by an intramuscular injection of 100 mg. of thiamine. Prior to extracting the posterior teeth in the right maxilla, the drug was again given by mouth for 4 days. Postoperative pain did not occur nor was healing unduly delayed. No thiamine was administered prior to extracting the lower anterior teeth. Some postoperative pain was experienced but was not as severe as previously. The prophylactic use of thiamine prevented postoperative pain from occurring following extraction of the anterior maxillary teeth. Whenever thiamine was not used as a prophylactic measure in this patient, postoperative pain and delayed healing resulted.

Thiamine was given parenterally to 20 patients requiring gingivectomy in order further to study and evaluate its use in the prevention of pain. The mouth of each patient was divided into quadrants and gingivectomy was performed on 1 quadrant at a time with about 1 week elapsing between operations. Ten milligrams of thiamine was infiltrated intraorally in 1 quadrant on each patient. As a control, the remaining quadrants were not so infiltrated. Different quadrants were used for the prophylactic injections of thiamine among the 20 patients so that

an equal number of maxillary and mandibular quadrants were represented. At the completion of the treatment of each patient he was asked to compare the postoperative reaction in the 4 quadrants. Five patients reported no pain or sensitivity of teeth in the thiamine-treated quadrant and pain and sensitivity in the untreated quadrants; 3 reported markedly less in the treated quadrant; 5 reported slightly less in the treated quadrant; 2 reported no discomfort either in the treated or untreated quadrants; 4 reported equal pain and sensitivity (slight) in both treated and untreated quadrants; and 1 reported pain and acute sensitivity in all teeth with possibly more pain in the treated quadrant. Of the 20 patients, 13 obtained beneficial results.

Pain following gingivectomy is not frequently severe, but in most patients there is some pain and increased sensitivity of the teeth. It is the dentist's responsibility to eliminate pain insofar as possible in all operative procedures. To this end, thiamine seems to be of some value in reducing pain and hypersensitivity of teeth following gingivectomies.

EFFECT OF THIAMINE ON PAIN THRESHOLD

In order to determine to what extent thiamine affects the pain threshold, measurements of this threshold were accomplished by a method similar to that of Shriner which consisted of estimating muscular sensitivity. A mercury manometer, constructed from a U-shaped, glass tube marked off in millimeters up to 600, was attached to an ordinary sphygmomanometer cuff. The test was accomplished by placing the cuff about the patient's calf muscles and pumping quickly to prevent ischemia until the patient felt a definite cramping pain in the muscle. The pressure reading in millimeters of mercury was recorded. It was found that the calf muscle was more sensitive to pain and a more accurate reading could be obtained than when the arm muscles were used.

Shriner observed that the pain threshold for the average man was much higher than that for the average woman, but I found that women showed a slightly higher threshold than men. Tests on 50 clinically normal men showed an average of 290 mm. Hg. pressure while tests on 50 clinically normal women showed an average of 310 mm. Hg. Tests were recorded on 16 patients with postoperative pain. They were repeated immediately after the pain was relieved by the use of thiamine. Whenever possible, tests were repeated a week or 2 after recovery. All patients in this series were relieved of pain with a single injection of thiamine. Table 1 shows the results of the tests and the dose of drug given to each patient.

Ten milligrams of thiamine were infiltrated intraorally in 13 of the patients. The pain threshold was not affected in 11 of these. Only 2 (patients 4 and 15) showed an increased pain threshold after thiamine had been injected. One hundred milligrams of the drug were injected intramuscularly in 3 patients, all of whom showed a definite raising of the pain threshold after the injection. The increase in pain threshold occurred simultaneously with relief of pain. Suspecting a possible subclinical thiamine deficiency in patients 1, 2, and 15, an effort was made to raise the pain threshold by the daily oral administration of multivitamins, but no increase was observed in these patients after 30 days of this therapy.

TABLE 1. *Pain thresholds on 16 patients with postoperative pain*

Patient	Pain threshold on admission (mm. Hg.)	Parenteral dose of thiamine (mg.)	Pain threshold after pain relief (mm. Hg.)	Pain threshold after 1 or 2 wk. (mm. Hg.)
1	200	100	260	200
2	220	100	280	220
3	280	100	320	320
4	220	10	300	300
5	200	10	200	200
6	460	10	460	460
7	180	10	180	180
8	320	10	320	320
9	280	10	280	*
10	200	10	200	200
11	260	10	260	260
12	240	10	240	240
13	200	10	200	200
14	280	10	280	280
15	200	10	260	200
16	240	10	240	*

* Patient not available for recheck.

A study of the effect of thiamine on the pain threshold of 10 clinically normal volunteers was made. One hundred milligrams of thiamine were injected intramuscularly in all and pain thresholds were recorded prior to injection, 20 minutes after injection, and then once each hour. The threshold was definitely raised in all but 2 subjects. A rise of from 18 to 55 percent (average 37) was noted within 20 minutes after injection. This level was usually maintained for about 2 hours, beginning to

decline in the third hour, and gradually returning to the original level in from 4 to 6 hours. Two subjects used in this study exhibited no change in their pain threshold. One had recently been treated with massive doses of thiamine given parenterally over a 30-day period. It would appear that when the thiamine content of the body is already high, additional thiamine does not raise the pain threshold.

Pain thresholds recorded on 84 women, who were in their seventh to ninth month of pregnancy, revealed an average of 233 mm. Hg. All but 5 had been taking multivitamins daily by mouth. The approximate daily amount of thiamine hydrochloride taken was 6 mg. In comparison to the average pain threshold of 310 mm. Hg. for the normal woman, these thresholds appear to be unusually low. The low pain thresholds observed may be interpreted to indicate that the ingested thiamine was not being properly assimilated or was insufficient to meet the increased requirements of pregnancy. It is also possible that the measurement of pain threshold by a pressure method may be unduly influenced by various circulatory disturbances of the legs such as varicosities and edema which are commonly associated with pregnancy. This latter explanation is supported by the fact that the average pain threshold of 21 women in their second puerperal month was 306 mm. Hg. None of these women suffered any circulatory disturbance of the extremities.

TOXICITY OF THIAMINE

Jolliffe *(89)*, in treating over 3,000 patients with massive doses of thiamine, did not observe any toxic reactions due to the vitamin and cites other observers as having had similar experience. Thiamine is not to be considered as a drug with definite limits as to dose but rather as a substance which is necessary to the body for proper functioning *(140)*. Unlike the fat soluble vitamins, it is water soluble and is not stored to any appreciable extent in the body. Any excess of thiamine that is not stored or utilized by the body is rapidly excreted by the kidneys.

Side reactions have been reported when thiamine is injected intraspinally. The sympathetic nervous system is stimulated *(90)* and a feeling of warmth in the extremities, slight elevation of temperature, weakness, buzzing in the ears, and a period of exacerbation of pain may follow its use *(141)*. These symptoms

(140) Cowgill, G. R.: Physiology of vitamin B_1. In The Vitamins; A Symposium Arranged Under the Auspices of the Council on Pharmacy and Chemistry and the Council on Foods of the American Medical Association. American Medical Association, Chicago, Ill., 1939. pp. 159-178.

(141) Kesert, B. H., and Grossman, M. O.: Intraspinal thiamin chloride in treatment of gastric crisis or lightning pains in tabes dorsalis; report of 8 cases. J. Nerv. & Ment. Dis. 101: 372-377, Apr. 1945.

242918 O - 53 - 4

may occur when doses of over 20 mg. are administered and may last for from several hours to several days *(90)*. Doses of from 5 to 10 mg. apparently can be injected into the spinal canal without producing any untoward reactions *(135)*. Given intraspinally, thiamine remains in the cerebrospinal fluid for several days *(90)*. For this reason, uncontrolled intraspinal administration may cause an overstimulation of the central nervous system which, in animals, has resulted in paralysis of the respiratory center and death *(142)*. Exacerbation of pain in painful dental disorders is observed when thiamine is infiltrated intraorally. No other untoward reactions have been noted.

A number of cases have been reported in which mild to severe reactions have occurred following parenteral administration of thiamine *(143–145)*. The symptoms have been of an anaphylactic nature and not those of toxicity. Two anaphylactic deaths have been reported following parenteral administration *(146, 147)*.

Weigand *(148)* reviewed all case reports of reactions to thiamine in the past decade and concluded that intolerance to thiamine develops with relative infrequency. Most of the reactions followed intravenous injection given either daily or weekly for several doses. When patients have had a series of thiamine injections followed by a rest period of a week or more, it is suggested that small initial doses should be administered intramuscularly rather than intravenously if parenteral therapy is to be resumed. The dose may be increased when it is evident that the patient has not been sensitized.

If minor allergic symptoms such as sneezing, flushing of the face, itching at the site of injection, asthma, nausea, and vomiting develop after parenteral administration, subsequent doses should not be given until desensitization can be accomplished. Patients in whom a sensitivity is suspected may be tested by intradermal injection of a diluted thiamine solution. Treatment for anaphylactic shock is artificial respiration and the intra-

(142) Haley, T. J., and Flesher, A. M.: Toxicity study of thiamine hydrochloride. Science 104: 567-568, Dec. 13, 1946.

(143) Schiff, L.: Collapse following parenteral administration of solution of thiamine hydrochloride. J. A. M. A. 117: 609, Aug. 23, 1941.

(144) Engelhardt, H. T., and Baird, V. C.: Sensitivity to thiamine hydrochloride; potential hazard in common office procedure. Ann. Allergy 4: 291-292, July-Aug. 1946.

(145) Laws, C. L.: Sensitization to thiamine hydrochloride. J. A. M. A. 117: 176, July 19, 1941.

(146) Mills, C. A. : Abstract of discussion on papers of Drs. Ruffin and Jolliffe. J. A. M. A. 117: 1500-1501, Nov. 1, 1941.

(147) Reingold, I. M., and Webb, F. R.: Sudden death following intravenous injection of thiamine hydrochloride. J. A. M. A. 130: 491-492, Feb. 23, 1946.

(148) Weigand, C. G.: Reactions attributed to administration of thiamin chloride. Geriatrics 5: 274-279, Sept.-Oct. 1950.

venous injection of 1 cc. of a 1:1,000 solution of epinephrine *(143, 149)*.

MODES OF ADMINISTRATION

The route of administration of thiamine depends on the site of the desired action, existing local and systemic conditions, the rapidity with which a response is to be elicited, and whether it is to be used as a dietary supplement, prophylactic measure, or therapeutic agent. Oral administration may be used whenever body requirements are increased or if an insufficient amount of thiamine is present in the diet, provided no gastrointestinal disturbance is present to interfere with absorption. In the past, baker's yeast has been prescribed as a convenient means of administering thiamine and other members of the vitamin B complex, but Parsons et al. *(150)* showed that thiamine is not readily absorbed when baker's yeast is ingested. Ness et al. *(151)* found that viable, fresh baker's yeast was not only not absorbed but it interfered with the absorption of thiamine from other sources.

Prevention or reduction of postoperative complications such as dry socket, pain, trismus, and hypersensitive teeth may be obtained by giving thiamine for 4 or 5 days prior to operation. Small oral doses of the drug have been found to be more completely absorbed than large doses *(33)*. When over 5 mg. is ingested, from 50 to 75 percent of the total amount is excreted in the stools *(42)*. Therefore, the recommended oral prophylactic dose is from 1 to 5 mg. t. i. d.

Free thiamine, but not cocarboxylase, is active in prohibiting the effects of acetylcholine and is essential in maintaining the chemical equilibrium of the nerve cell *(23)*. During degeneration or when the nerve is injured, thiamine is rapidly lost and must be replaced in the free form to re-establish proper nerve function. When orally ingested thiamine is absorbed from the small and large intestine, it is carried to the liver *(152)* where a major portion is transformed into cocarboxylase and some is retained for storage *(37)* before entering the general circulation. Ninety percent of the total blood thiamine is in the form of cocarboxylase

(149) Jolliffe, N.: Abstract of Discussion on papers of Drs. Ruffin and Joffiffe. J. A. M. A. 117: 1501, Nov. 1, 1941.

(150) Parsons, H. T.; Williamson, A.; and Johnson, M. L.: Availability of vitamins from yeast; absorption of thiamine by human subjects from various types of baker's yeast. J. Nutrition 29: 373-381, June 1945.

(151) Ness, H. T.; Price, E. L.; and Parsons, H. T.: Thiamine depletion of human subjects on diet rich in thiamine. Science 103: 198-199, Feb. 15, 1946.

(152) Grollman, A.: Pharmacology and Therapeutics. Lea & Febiger, Philadelphia, Pa., 1951. p. 31.

(36). Very little free thiamine is able to reach the affected nerves when it is given by mouth. When it is parenterally administered, absorption of the free form takes place almost immediately and it is conveyed rapidly by the circulation to the affected part before phosphorylation to any degree can take place. Beneficial results are thereby obtained in nerve diseases promptly and effectively. Hence, in the therapeutic use of large doses of thiamine, when the action of free thiamine is desired, administration should be parenteral rather than oral.

Parenteral administration can be accomplished in various ways. Intraoral infiltration or submucous injection produces the quickest response in the treatment of certain oral conditions. Smaller concentrations are more effective when injected intraorally than when injected intramuscularly. In painful conditions of the oral cavity, intraoral injection produces a period of exacerbation of pain which in some patients is severe. It is contraindicated (1) when the existing pain is so severe that increasing the pain even for a short time is undesirable, (2) in the presence of acute inflammation, and (3) when a systemic effect as well as a local effect is desired. High concentrations of thiamine injected intraorally are also contraindicated, not only because of the more severe exacerbation of pain, but because rapid absorption into the circulation may further the development of sensitization, especially when repeated doses are given. The therapeutic dose is 10 mg.

Intramuscular injection produces a mild, burning sensation at the site of injection, but the local irritation is less than that following intraoral injection. Furthermore, there is no exacerbation of pain if pain is present. The injection may be either in the deltoid muscle or in the upper, outer quadrant of the buttock. Larger intramuscular doses are required for effective therapy in dental disorders than are required when intraoral injections are given. Response to treatment is not as rapid as it is following intraoral injections but the difference in time is negligible because using either route, beneficial results are usually obtained in a matter of minutes. Intramuscular injection is the method of choice when large doses are to be given over a long period and when a systemic as well as a local effect is desired. The usual therapeutic dose is 1 cc. (100 mg.) of concentrated thiamine hydrochloride solution.

Intravenous injection has been used extensively because of its immediate effect and the smaller dose required, but almost all of the cases in which sensitivity has developed or untoward effects have been observed have occurred following the intravenous injection of large doses of thiamine. For this reason, intravenous injection is not recommended. Furthermore, as a

precautionary measure in giving intramuscular injections, aspiration should be attempted to make sure that the vitamin is not directly introduced into a blood vessel. The therapeutic dose is from 10 to 50 mg.

Intraspinal injection has been used in the relief of intractable pain in inoperable cancer and chronic inflammatory and degenerative diseases of the central nervous system *(90, 135, 141)*. It has proved beneficial when other routes have failed, but, in dentistry, there will be little occasion to use intraspinal injections because most dental conditions involve the peripheral nervous system. When dental conditions are associated with central nervous system diseases, a neurologist or neurosurgeon should be consulted. The dentist should, nevertheless, be aware of the use and indication for intraspinal administration. The therapeutic dose is from 5 to 100 mg.

DISCUSSION

Thiamine is an important therapeutic agent in dentistry, especially in the control and prevention of pain. From a physiologic standpoint, the use of thiamine is most desirable because it is a normal metabolic substance, the use of which is associated with a minimum of side reactions. With the exception of intraspinal injections, there is no danger of overdosing because any excess that is not stored or utilized by the body is rapidly excreted by the kidneys.

A new method of parenteral administration of thiamine, which may be termed intraoral infiltration or submucous injection, was shown in this study to be of value in the treatment of certain dental conditions. The beneficial effects obtained by this method were more prompt and more effective than those produced by other parenteral routes and the dose required was much smaller. That parenteral administration inhibits muscular contractions was shown in a series of patients with trismus. This suggests other uses in dentistry such as the induction of muscular relaxation in patients with fractured jaws and reducing the muscular fatigue experienced in patients with new dentures.

The raising of the pain threshold produced by the parenteral administration of thiamine revealed in this study opens up many new possibilities for the application of thiamine in dentistry. Its analgesic effect suggests its use in preoperative medication. Relieving the apprehension, nervousness, and tenseness of the dental patient would be of value, especially in patients who are subclinically deficient in thiamine.

From the time Williams and Cline first synthesized thiamine in 1936 until about 1945, it was widely and often indiscriminately used in medicine for many and various disorders. In the past

few years, the pendulum has swung in the opposite direction, and its use, other than as a dietary supplement, has been largely neglected. It is time that it be re-evaluated for many of its beneficial effects are not being used to advantage.

The literature is almost devoid of references to the therapeutic use of thiamine in dentistry. Many dentists are unaware of the many beneficial effects that may be obtained by its proper use. It is hoped that these articles have given the reader sufficient experimental data, clinical observations, and basic physiologic knowledge so that its therapeutic use will be intelligent and rational rather than empirical.

CONCLUSIONS

Dental postoperative pain is promptly and completely relieved in most patients by the administration of thiamine. Its prophylactic use materially aids in reducing the occurrence of postoperative pain. Therapeutic results are best obtained by its parenteral administration.

Besides relieving pain, the healing time in dry sockets is greatly reduced by thiamine therapy. Neuralgia and neuritis of long standing in which various degrees of degeneration have occurred require prolonged and intensive thiamine therapy. Thiamine has a "curare-like" effect on muscle and relieves the tonic spasms of trismus.

Low pain threshold is peculiar to those patients suffering from painful dental conditions and may be indicative of thiamine deficiency. Paralysis and paresthesia of nerves are greatly benefited by thiamine.

In most patients dental pain is relieved promptly by the intraoral infiltration of 10 mg. of the drug, the results being equivalent to those obtained when 100 mg. are injected intramuscularly.

The intraoral infiltration of thiamine invariably produces a transitory period of pain exacerbation which is directly proportional to the degree of pain already present. Hypersensitive teeth due to trauma, mechanical irritation, deep scaling and curettage, and operative dental procedures are greatly improved or completely relieved by thiamine. Hypersensitive teeth due to caries and erosion are not materially benefited.

It is not inconceivable that the loss of thiamine from the nerves is one of the major chemical factors in the production of pain. There is ample evidence that the replacement of free thiamine to injured and diseased nerves not only restores proper functioning but relieves pain. It is not desired to imply that thiamine is the sole factor concerned in the production of pain,

but it is believed that it is of prime importance in nerve physiology and that it should be given whenever injury, disease, avitaminosis, or degeneration of the nerves is suspected.

BOOKS RECEIVED

Surgical Applied Anatomy, by Sir *Frederick Treves,* Bt. 12th edition, revised by *Lambert Charles Rogers,* V. R. D., M. D., M. Sc., F. R. C. S., F. R. C. S. E., F. R. A. C. S., F. A. C. S., Professor of Surgery, University of Wales; Director of Surgical Unit, Cardiff Royal Infirmary; Surgeon, United Cardiff Hospitals; Surgical Consultant to the Royal Navy; Member of Council, Royal College of Surgeons of England; Formerly Member of Court of Examiners, Royal College of Surgeons of England; Prosector to the University of London and the Royal Colleges of Physicians and Surgeons and Examiner in Anatomy to the Conjoint Examining Board in London. 590 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1953.

Clinical Obstetrics, by *Members of the Staff of the Pennsylvania Hospital.* Edited by *Clifford B. Lull,* M. D., Late Director, Division of Obstetrics and Gynecology, Pennsylvania Hospital and *Robert A. Kimbrough,* M. D., Director of the Division of Obstetrics and Gynecology, Pennsylvania Hospital; Professor of Gynecology and Obstetrics, Graduate School of Medicine, University of Pennsylvania; Gynecologist to the Graduate Hospital. 732 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1953.

Unipolar Lead Electrocardiography and Vectrocardiography, Including the Standard Leads, the aV and V Leads, the Cardiac Arrhythmias and the Principles of Vectorcardiography, by *Emanuel Goldberger,* M. D., F. A. C. P., Associate Attending Physician, Montefiore Hospital, New York, N. Y.; Cardiologist and Attending Physician, Lincoln Hospital, New York, N. Y.; Consulting Cardiologist, St. Joseph's Hospital, Yonkers, N. Y.; Diplomate of the American Board of Internal Medicine; Lecturer in Medicine, Columbia University. 3d edition, thoroughly revised. 601 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1953. Price $10.

Acute Renal Failure, Including the Use of the Artificial Kidney, by *John T. MacLean,* M. D., F. R. C. S. (C)., F. A. C. S., Assistant Urologist, Royal Victoria Hospital; Director of Urology, Queen Mary's Veterans Hospital; Department of Veterans Affairs; Demonstrator in Surgery, McGill University, Montreal, Canada. 114 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952.

Problems of Consciousness, Transactions of the Third Conference, March 10 and 11, 1952, New York, N. Y., edited by *Harold A. Abramson,* M. D., Associate Physician for allergy, The Mt. Sinai Hospital, New York, N. Y. 156 pages; illustrated. Sponsored by the *Josiah Macy, Jr. Foundation;* printed by Corlies, Macy & Co., Inc., New York, N. Y., publishers, 1952. Price $3.25.

Gynecology, Diseases and Minor Surgery, compiled and edited by *Robert J. Lowrie,* M. A., M. D., F. A. C. S., D-OG., Associate Clinical Professor of Obstetrics and Gynecology, College of Medicine, New York University; Attending Gynecologist and Obstetrician, St. Vincent's Hospital; Attending Obstetrician, City Hospital, Welfare Island; Attending Gynecologist, Willard Parker Hospital; Formerly, Chairman, Section of Obstetrics and Gynecology, New York Academy of Medicine, New York, N. Y.; Consultant in Gynecology and Obstetrics, Passaic General Hospital, Passaic, N. J.; Fellow of the New York Academy of Medicine; Fellow of the American Public Health Association. Foreword by *Claude E. Heaton,* M. D. 806 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $22.50.

Gynecological and Obstetrical Pathology, by *Peter A. Herbut,* M. D., Professor of Pathology, Jefferson Medical College and Director of Clinical Laboratories, Jefferson Medical College Hospital, Philadelphia, Pa. 683 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1953. Price $12.50.

Poliomyelitis, Papers and Discussions Presented at the Second International Poliomyelitis Conference, compiled and edited for the *International Poliomyelitis Congress.* 555 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1952.

The 1952 Year Book of Drug Therapy (August 1951-August 1952), edited by *Harry Beckman,* M. D., Director, Departments of Pharmacology, Marquette University Schools of Medicine and Dentistry; Consulting Physician, Milwaukee County General and Columbia Hospitals, Milwaukee, Wis. 606 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1952. Price $5.50.

A Vitamin Digest, by *Guy W. Clark,* Technical Director, Lederle Laboratories Division, American Cyanamid Company, Pearl River, N. Y. 254 pages. Charles C Thomas, Publisher, Springfield, Ill., 1953. Price $6.50.

Therapeutic Use of Pools and Tanks, by *Charles L. Lowman,* M. D., D. Sc., F. A. C. S., F. A. A. P. E., Director of Education and Rehabilitation, Orthopaedic Hospital, Los Angeles, and *Susan G. Roen,* Director of Physical Therapy, Orthopaedic Hospital, Los Angeles. 90 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

Standard Values in Blood, Being the first fascicle of a Handbook of Biological Data, edited by *Errett C. Albritton,* A. B., M. D., Fry Professor of Physiology, The George Washington University. 199 pages. Prepared under the Direction of the Committee on the Handbook of Biological Data, American Institute of Biological Sciences, The National Research Council. W. B. Saunders Co., Philadelphia, Pa., 1952.

Regeneration and Wound-Healing, by *A. E. Needham,* M. A., B. Sc., University Demonstrator in Zoology, University of Oxford. 152 pages; illustrated. John Wiley & Sons, Inc., New York, N. Y., publishers, 1952.

CARCINOMA OF THE PROSTATE

JAMES C. KIMBROUGH, *Colonel, MC, USA (1)*

CARCINOMA of the prostate develops in 3 ways: (1) the cancer occurs in the posterior lobe in from 80 to 90 percent of the patients affected; (2) it develops diffusely in one or both lateral lobes in from 10 to 20 percent; or, (3) it is associated with prostatic hypertrophy. Because the prostate of all men over 50 years of age undergoes hypertrophy (unless it is destroyed by infection) and the incidence of carcinoma increases after this age, it is only logical to assume that the occurrence of this disease is usually associated with such enlargement.

INCIDENCE

Autopsy reports in men over 50 years old indicate that about 20 percent are afflicted with carcinoma of the prostate. In a series of 513 patients treated at this hospital for prostatic hypertrophy and carcinoma of the prostate during the decade 1940 through 1949, 78, or 15.2 percent, had carcinoma *(2)*. The high incidence of malignancy makes this disease an important factor in the Armed Forces (table 1).

TABLE 1. *Incidence of prostatic carcinoma in selected group at Walter Reed Army Hospital*

Year	Patients with		Total	Percent with carcinoma
	Benign prostatic hypertrophy	Prostatic carcinoma		
1940	42	10	52	19.2
1941	49	3	52	5.7
1942	29	4	33	12.1
1943	32	4	36	11.1
1944	26	4	30	13.3
1945	41	2	43	4.7
1946	50	7	57	12.3
1947	50	18	68	26.5
1948	59	14	73	19.2
1949	57	12	69	17.4
Total	435	78	513	15.2

(1) Walter Reed Army Hospital, Washington, D. C.

(2) Kimbrough, J. C., and Rowe, R. B.: Carcinoma of prostate. J. Urol. 66: 373-378, Sept. 1951.

AGE

The average age in this series of 78 patients was 65.8 years (range 43 to 89) (table 2). Since 1950, two patients, 17 and 20 years old respectively, have been treated for carcinoma of the prostate. The average age of patients amenable to radical surgery was 65.2 years. The youngest was 51, the oldest, 74 years.

TABLE 2. *Age distribution of patients with prostatic carcinoma*

Age of patients (years)	Number of patients	Percent
40-49	2	2.6
50-59	19	24.3
60-69	33	42.3
70-79	18	23.1
80-	6	7.7
Total	78	100.0

ETIOLOGY

The prostate is not an endocrine gland. Its secretion contains organic material and enzymes. The most important enzyme is acid phosphatase. The evolution of the prostate is controlled, to a great extent, by hormones elaborated by the testes. The testicular hormone imbalance resulting from senility is an important etiologic factor. The incidence of cancer increases with age. No explanation is attempted for its rare occurrence in young men. Testosterone exacerbates the growth of carcinoma of the prostate. The theory has been advanced that the use of testosterone for the "male menopause" as well as for other diseases increases the incidence of malignancy. It will require much observation, however, to clarify this conjecture.

PATHOLOGY

Adenocarcinoma of the prostate is the most common type. The acini may be small, numerous, crowded, and lined with a single layer of cells, or they may be large and filled with malignant cells. The scirrhous type shows infiltrating lines of aberrant cell groups. Various types of squamous metaplasia of the acini may resemble cancer. Mistaking such metaplasia for cancer may account for some of the long-time cures attributed to the use of conservative measures. In the younger patient, the carcinoma is usually highly undifferentiated (anaplastic) and rapidly fatal.

EXTENSION BEYOND THE PROSTATIC CAPSULE

Extension by continuity to the urethra, rectum, and bladder. The urethra is invaded most frequently and invasion may occur early. Invasion of the bladder occurs later and affects the trigone first. The trigone then presents a rigid corrugated appearance on cystoscopic examination. Extension to the seminal vesicles occurs late. The fascia of the vesicles is involved more often than the vesicles themselves. Perineural invasion occurs simultaneously with the involvement of the seminal vesicles and accounts for the early sacral and lumbar pain. Extension to the periureteric tissues may cause ureteral obstruction and hydronephrosis. The rectovesical (Denonvilliers') fascia is a tough membrane and a barrier to rectal invasion. Such invasion is rare and occurs only late in the course of the disease.

Extension by the lymphatic system. Lymphatic invasion takes place along the route of the lymph drainage, the seminal vesicles, rectum, and lymph nodes of the external and internal iliac chains and passes upward along the abdominal and thoracic vessels to the abdominal, mediastinal, and supraclavicular glands. Rarely are the femoral and inguinal glands involved.

Extension by the blood stream. Any part of the body may be involved by blood stream extension. The most common site is the sacrum, pelvic bones, and lumbar vertebras. Later, the ribs and long bones may be involved. The first metastasis observed is usually in the bones of the pelvis, the lumbar vertebras, and the lungs.

SYMPTOMS

Symptoms occur late and indicate failure to perform a rectal examination early in the course of the disease. They are due to local extension to the urethra, bladder, pelvic nerves, and rectum. Frequency, difficult urination, and retention may occur, simulating benign prostatic hypertrophy. Gross hematuria is usually a late occurrence.

Lumbar pain and pain along the sciatic nerve may be the first symptom noted and is due to perineural involvement. Rectal symptoms result from local extension and lymphatic metastases. Very rarely, the first symptoms noted are due to metastases to distant parts of the body—the ribs, humerus, and other long bones. Patients with these symptoms may be treated several months for arthritis and other diseases before an alert physician does a digital rectal examination. All these symptoms occur late in the development of the cancerous process in the prostate. Except in very rare instances, the disease can be detected by rectal

examination many months before symptoms appear. When symptoms appear, it is usually too late for curative surgical extirpation and palliative conservative therapy is the only procedure available.

EARLY DIAGNOSIS

Early diagnosis, established by digital rectal examination, is the only procedure which will enable most patients with carcinoma of the prostate to be cured by radical excision. When urinary symptoms appear, only about 8 percent of the patients may be cured by operation. Radical excision has been feasible in more than 66 percent of the patients at this hospital since 1946. In a great measure this has been accomplished by requiring digital rectal palpation in annual physical examinations. Similar results could be attained in the civilian population by the proper publicity in the lay press emphasizing the fact that 1 in every 5 men over 50 years of age has cancer of the prostate which can be cured only by early diagnosis and radical excision. In cancer detection propaganda great attention has been given to carcinoma of the breast and other organs. There is no excuse for neglecting carcinoma of the prostate in this publicity.

In our series of 78 patients (*2*), digital rectal examination provided the most valuable information prior to operation. Early in the disease, a hard nodule was the first sign. As the carcinoma increased in size, the hardness extended; the gland became fixed and nodular and encroached on the membranous urethra. Later the induration involved the seminal vesicles and filled the intervesicular space.

The rectal examination was negative for carcinoma in 6 patients, and the proper diagnosis was established by pathologic examination after operation. In 2 patients a positive diagnosis by rectal examination was proved erroneous by perineal biopsy at operation or by pathologic examination. Digital rectal examination was erroneous in less than 10 percent of the patients, and was considered the most reliable diagnostic procedure. Roentgenograms of the bony pelvis, lumbar vertebras, thorax, and long bones showed metastatic lesions. The perineal punch biopsy was used, but was often misleading unless the tissue for examination was removed from the cancerous area. The diagnosis was established or confirmed by examination of the tissue removed in transurethral resection in 18 patients and was negative in 2. The specimen from the perineal punch biopsy was positive in 2 patients and negative in 2. Cytologic examinations were made in the past 3 years and were positive in a few patients. Cystoscopy provided little information except in patients with advanced disease involving the trigone. Increase in the serum acid phosphatase was noted with the presence of metastatic lesions.

This increase was present in no other process. Androgen estimations were not helpful. Pain and urinary obstruction occurred late. In 2 patients, the first symptom was pain from metastatic lesions. Sternal or iliac biopsy specimens may show early metastases.

The importance of the digital rectal investigation as a part of every physical examination in men over 40 years of age cannot be overemphasized. Since 1946 this phase of the examination has been stressed in the Army physical examination. A sharp rise in the number of patients with prostatic carcinoma found and a great increase in the percent amenable for radical extirpation have followed these rectal examinations.

Differential diagnosis is not often difficult. Fibrosis following infection, calculi, and tuberculosis, may be confusing. Sarcoma is rare and may require a biopsy for final diagnosis, but these tumors are usually larger, softer, and occur in younger men.

TREATMENT

Palliative treatment has been used in patients who showed evidence of metastases or local extension beyond the limits of a cure with radical excision. In 1940 there were 10 such patients in this hospital, only 1 of whom could be cured by radical excision. Palliative measures were used on the others. At that time x-ray therapy, sedation, and general care were the available measures. In 1941, castration and estrogen therapy were initiated *(3, 4)*. Five patients treated by these measures were bedridden with advanced metastases and were suffering great pain. The effect of castration and estrogen therapy was dramatic for the relief of pain, the recession of metastases, and the reduction in size of the prostate gland. These patients, now dead, have been reported by Herbst *(4)*.

In our series of 78 patients *(2)*, 50 percent received only palliative therapy. This therapy gave remarkable results in the relief of pain, recession of metastases, reduction in the size of the gland, and the prolongation of life. Thirty-one patients were treated by castration and 8 of these had radical excision. A few refused castration and were treated by stilbestrol. Because of their age (81 and 85 years), 2 patients were treated by conservative perineal prostatectomy. Both were alive and well 5 and 6 years, respectively, after operation. The most controversial phase concerning the use of estrogen therapy is the time when it

(3) Huggins, C., and Hodges, C. V.: Studies on prostatic cancer; effect of castration, of estrogen and of androgen injection on serum phosphatases in metastatic carcinoma of prostate. Cancer Research 1: 293-297, Apr. 1941.

(4) Herbst, W. P.: Thoughts and observations on relation of altered hormonal balance to prostatic malignancy. Urol. & Cutan. Rev. 46: 691-694, Nov. 1942.

should be begun. At this hospital, estrogen therapy plus castration is initiated as soon as it is established that there is extension of the malignant process beyond the possibility of surgical eradication.

Estrogen therapy and castration are used simultaneously. It has been established that castration plus estrogen therapy gives much better and more rapid results than estrogen therapy alone. It is realized that estrogen therapy may eventually become ineffective and may have a definite therapeutic time span and that delaying this therapy until it is required for the relief of pain may give the patient greater longevity than it would if used in the early treatment. It is believed, however, that the earlier this therapy is begun, the better will be the results.

Transurethral resection for the relief of obstructive symptoms and for diagnostic purposes was used in 18 patients. The decrease in the size of the gland following estrogen therapy reduced the number of patients requiring transurethral resection for the relief of obstruction. Prefrontal lobotomy was performed with good results in 3 patients. In 2 others a cystostomy drain was necessary. X-ray therapy was practiced when other agents failed. The shortest duration noted for the effectiveness of estrogen therapy was 18 months. The patient died of metastases 2 years after castration and the use of stilbestrol. The response was not remarkable, and the agent lost its effectiveness for the relief of pain. The pain in this patient was controlled by prefrontal lobotomy.

Bony metastases has been affected very little by estrogen therapy. Metastases to the lung in some patients, however, have disappeared.

Hormonal therapy appears to have a definite period of effectiveness, varying with the type of carcinoma, the age of the patient, and the time such treatment was begun. Eventually the adrenals hypertrophy and compensate for the loss of the gonads and thereby neutralize the estrogen administered.

Chlorotrianisene, an estrogen product, is reputed to cause no adrenal hyperplasia, but its value is not yet definitely established.

Bilateral adrenalectomy has been used to relieve the pain in terminal cases when castration and estrogen therapy no longer are effective. A patient with an adrenalectomy may be carried satisfactorily on a daily maintenance dose of from 25 to 50 mg. of cortisone. Because of the good results of palliative therapy, radical excision is not advised in patients over 70 years of age and with less than 3 years of life expectancy. Castration *plus* estrogen therapy gives better results than either used alone.

Gold isotope, according to the technic of Flocks *(5)* is being tried but so far has not been used at this hospital. Irradiation therapy has been used to relieve pain in patients with extensive metastases.

Curative. Complete surgical excision of the involved structures is the only means which will effect a cure. Such treatment is made possible by early diagnosis. Radical prostatectomy has been performed on 39 patients in this series. The perineal approach was used in 38 and the retropubic in 1. Table 3 shows the number and percentage of patients who had radical operations.

TABLE 3. *Number and percent of patients treated surgically*

Year	Patients with prostatic carcinoma	Patients treated with perineal prostatectomy	
		Number	Percent
1940	10	1	10
1941	3	0	0
1942	4	0	0
1943	4	1	25
1944	4	2	50
1945	2	2	100
1946	7	3	42.9
1947	18	13	72.2
1948	14	9	64.3
1949	12	8	66.7
Total	78	39	50

Usually the diagnosis was made by the finding of an isolated nodule. Following the success of estrogen therapy in reducing the size of the gland, the indications for radical perineal prostatectomy were extended to include prostates decreased to operative limits by such therapy *(6)*. It is too early, however, to evaluate the effectiveness of this type of treatment. In the patients who showed no extension beyond the parts removed by operation, no other therapy was used. When the pathologic specimen removed showed definite evidence of extension of the malignancy beyond

(5) Flocks, R. (Iowa City University Hospital): Personal communication.

(6) Colston, J. A. C., and Brendler, H.: Endocrine therapy in carcinoma of prostate. J. A. M. A. 134: 848-853, July 5, 1947.

the surgical excision, castration was performed and estrogen therapy was begun soon after radical operation (7).

Eight patients in this series were treated by castration—1 in 1944, 1 in 1947, 3 in 1948, and 3 in 1949. With the growing interest in early diagnosis in the past 3 years, the patients selected for radical excision have increased markedly. At present about 70 percent of the patients are considered amenable to such treatment. This compares favorably with the optimistic predictions of Gutierrez (8).

PROGNOSIS

The prognosis depends on: (1) the age of the patient at onset, (2) the type of lesion present, and (3) the time in the course of the disease when treatment is begun.

In patients under 50 years of age, the prognosis is uniformly poor unless early detection makes radical extirpation feasible. The 2 young adults, reported earlier, rapidly progressed to death in spite of castration and hormone therapy. Another patient, 43 years of age, had little relief and no arrest of the progress of the lesion. Patients over 65 years of age have little curtailment of activity or prolongation of life with such treatment. The patients given hormonal and castration treatment in 1941, 1942, and 1943 were in the terminal stage of their disease and have since died. One patient survived for 10 years on palliative treatment which was begun in 1941. Others survived 8 years or less.

The type of lesion is important in the prognosis. Those patients who have squamous metaplastic tumors survive the longest—so long, in fact, that the original diagnosis of malignancy is questionable. The elderly patients who have adenocarcinoma with small acini do very well. Anaplastic (highly undifferentiated) tumors are usually found in young patients and such patients have little life expectancy regardless of the type of therapy given.

The time in the course of the disease when treatment is begun is the most important factor in the prognosis. Cancer of the prostate, like cancer in other parts of the body, is curable if recognized early enough for total surgical extirpation to be carried out.

Under the Army regimen of annual physical examination with rectal examination, about 60 percent of the patients admitted to this hospital have been amenable to cure by radical excision.

---

(7) Higbee, D. R.: Status of perineal prostatectomy today. J. A. M. A. 139: 141-144, Jan. 15, 1949.

(8) Gutierrez, R.: New horizons in surgical management of carcinoma of prostate gland. Am. J. Surg. 78: 147-169, Aug. 1949.

The rest were mostly retired personnel who were not seen until symptoms appeared—too late for cure.

The period of observation has not been sufficient to evaluate the results of radical excision, but the indications are that about 85 percent of such patients will survive until other causes terminate their lives. Estrogen therapy instituted 3 or 4 weeks prior to operation renders doubtful cases amenable to cure by radical excision. The complications and sequelas following operation are inconsequential when the question of cure is concerned. When the occasional urinary incontinence, impotence, and other postoperative complications are evaluated, these are a small price to pay for the cure of such a dreadful disease as cancer.

CONCLUSIONS

Early detection by digital rectal examination is the most important factor in the therapy of carcinoma of the prostate. In patients who are in the advanced stages of the disease and therefore incurable by extirpation of the prostate, castration plus estrogen therapy gives the best results. This type of treatment should be instituted early in the course of the disease. Bilateral adrenalectomy has a definite place in relieving pain and prolonging life in terminal cases.

BOOK REVIEWS

Gynecologic and Obstetric Pathology With Clinical and Endocrine Relations, by *Emil Novak*, A. B., M. D., D. Sc. (Hon., Trinity College, Dublin; Tulane), F. A. C. S., F. R. C. O. G. (Hon.); Assistant Professor Emeritus of Gynecology, The Johns Hopkins Medical School; Gynecologist, Bon Secours and St. Agnes Hospitals, Baltimore, Md.; Fellow and Past President, American Gynecological Society. 3d edition. 595 pages; 630 illustrations, 19 in color. W. B. Saunders Co., Philadelphia, Pa., publisher, 1952.

Because of rapidly expanding knowledge in the field of gynecologic and obstetrical pathology, particularly relating to neoplastic diseases, many additions have been made in this text. Most noteworthy is the discussion of cervical carcinoma in situ which is much more comprehensive than that found in the previous editions. The extremes of physiologic change often associated with pregnancy are also carefully described. Although the diagnosis of uterine cancer by vaginal smears is also included the author is not enthusiastic about this technic except in the hands of a few experts. The chapter on hydatidiform moles and chorionepithelioma malignum has been extensively

242918 O - 53 - 5

rewritten and is now an impartial presentation of the current controversy between Hertig and the author concerning the malignancy of these lesions. Novak's classification of ovarian tumors remains essentially unchanged, but the discussion now includes paragraphs on gynandroblastomas, virilizing hilus cell tumors, and on the homology of certain ovarian and testicular tumors. In the chapter on placental abnormalities, a whole new section is devoted to premature separations. In response to popular demand, the author has added a chapter on the common breast lesions of gynecologic interest.

This text has always served admirably as an atlas because of the many excellent illustrations. Nearly 100 new ones have been added. In the preface the author describes himself as a clinician with pathology as a hobby. Modestly he does not mention that as a "hobbyist" he is consulted perhaps more often than any other pathologist in his field. Only experience as extensive as his could produce such a book. It is believed indispensable in the library of the gynecologist and the general pathologist. It is also heartily recommended to the general practitioner and to the medical student meeting this fascinating but vexing subject for the first time.—*Lt. Comdr. T. R. Mafit, MC, USN*

The 1952 Year Book of Medicine (May 1951-May 1952), edited by *Paul B. Beeson,* M. D.; *J. Burns Amberson,* M. D.; *William B. Castle,* M. D.; *Tinsley R. Harrison,* M. D.; *George B. Eusterman,* M. D.; and *Robert H. Williams,* M. D. 735 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1952. Price $6.

This year book abstracts the literature in internal medicine for 1951 under the following divisions: (1) infections, (2) the chest, (3) the blood and blood-forming organs, (4) the heart and blood vessels and the kidney, (5) the digestive system, and (6) metabolism. The latter is included in this year's review for the first time. The editors have presented articles that portray the most recent advances. Many controversial articles are included and they are clarified by the excellent editorial comments which are one of the best features of this book. There is an especially good review of the current status of the drugs effective against tuberculosis. This book is particularly recommended to all physicians who wish to keep abreast of the voluminous literature on internal medicine.

—*Lt. Col. T. A. Haedicke, MC, AUS*

THE USE OF MELAMINE FORMALDEHYDE IN THE APPLICATION OF CASTS[1]

AUGUST W. SPITTLER, *Colonel, MC, USA*
JOHN J. BRENNAN, *Lieutenant Colonel, MC, USA*
JOHN W. PAYNE, *Major, USAF (MC)*

SINCE the first use of plaster in immobilization of fractures and associated injuries, attempts have been made to improve the agents used in the application of casts and splints. Various substances have been studied at this hospital with a view toward increasing the strength and durability and reducing the weight and bulk of plaster casts. Since February 1951, we have studied the combination of melamine formaldehyde (MF) plastic resin with plaster of paris.

MF powder is mixed with water to make a 30-percent solution by weight just prior to the soaking of the plaster bandage. Thorough stirring by hand is required to assure an even mixture. To this solution, an amount of ammonium chloride equal to 3 percent of the weight of the MF is added as a catalyst to speed setting. Although 0.5 percent by weight of alum will speed setting, this catalyst reduces the "pot life" (stability) of the solution. Three percent by weight of sodium chloride was found to be as good a catalyst as ammonium chloride. The addition of a catalyst is not necessary. Rolls of plaster may be soaked in a pail of solution until all the solution is absorbed without changing the quality of the resultant cast as long as soaking is within the time limits of the solution's pot life. In this series, the hard-coated, fast-setting, acetic acid-free plaster prepared for use in the Armed Forces was used. MF in a 50-percent solution may be stored for 2 weeks or more without loss of stability but should be diluted to 30 percent before it is applied to a cast. It goes into solution in a range of from about 20 to 65 percent. Higher concentrations produce a brittle cast and lower concentrations are ineffective.

The disposal of plaster residue containing MF presented a problem because it had a greater tendency to plug the disposal sink than plaster in water. This has been solved by using a wax

[1] Walter Reed Army Hospital, Washington, D. C.

bag in the mixing pail and disposing of only the liquid portion in the sink. The precipitate in the wax bag is disposed of as solid waste.

TABLE 1. *Comparative strength of plaster casts*

Layers in splint	Size of depression (mm.)	
	Plaster in water	Plaster in MF solution
8	3.5	0.5
6	4.5	1.0
4	5.0	1.5
2	5.8	2.0

The stability of solution, setting time, drying time, strength of casts, water resistance, and penetration by x-ray were studied. The materials used were plaster splints of 2, 4, 6, and 8 thicknesses, each thickness measuring 4 by 15 inches. All splints were made by the same investigator to assure equal quality and consistency. The strength of MF-impregnated splints as compared with plain plaster splints was measured by exerting a 60-kg. weight at a constant and equal pressure, using the Rockwell hardness tester. The diameter of the depression made by the ball point was then measured to indicate the resistance to depression (table 1).

TABLE 2. *Comparative stability of solutions of MF*

Period of soaking (minutes)	Quality of splint
0	Excellent
15	Excellent
30	Excellent
45	Excellent
60	Excellent
75	Good
90	Good
105	Good
120	Fair
135	Poor
150	Poor

Pot life was measured by soaking plaster splints in MF solution for varying periods to determine how long after mixing the solution it was still effective (table 2).

Setting time was measured by making identical splints of plaster soaked in water and in MF solution, timing each to the point of setting. The setting time was found to be almost identical. The tensile strength of those made with MF at the time of setting was much greater than that of those made with water. Heat in the range between 90° and 100° F. equally influenced each. Baking at a temperature of 140° F. produced quicker drying with MF solution than with water. At temperatures over 140° F., the MF casts became too brittle for use (table 3).

TABLE 3. *Comparison of drying time of casts at 140° F.*

Layers in splint	Drying time (hours)	
	Plaster with water	Plaster with MF
8	12	6
6	8	4
4	6	2
2	3	1

Water resistance was tested by soaking equally dried splints of the same thickness and consistency of both plain plaster and MF-soaked plaster. Splints of 4 and 6 thicknesses were used. Splints of plain plaster were soft after 5 minutes; pliable after 10 minutes; and completely useless after 20 or 30 minutes of soaking. Splints made with MF were still firm and retained their shape and strength at the end of 7 days of soaking.

X-ray penetration was not affected by the solution, but the reduction in thickness obtained by using MF solution resulted in better detail.

A series of 52 casts were applied and followed by the same investigator throughout the study. The results are shown in table 4. Each splint consisted of 3 layers; 3-inch splints were 15 inches in length; 6-inch splints were 32 inches in length. Rolls of plaster were either 3, 4, or 6 inches wide and 5 yards long. All plaster used was of the hard-coated, fast-setting, specialist type, free of acetic acid. Casts were applied in a standard manner using both padded and skintight technic. Several of the casts were "case hardened" by rubbing the precipitate in the bottom of the pail on the exterior of the cast to produce a glazed waterproof exterior. Several of the casts were wedged after setting.

TABLE 4. *Results obtained with 52 MF-soaked plaster casts**

Patient	Age (years)	Diagnosis	Type of cast	Time worn (days)	Splints		Rolls			Remarks	Complications
					3 in.	6 in.	3 in.	4 in.	6 in.		
2	20	FCC of right tibia and fibula	Long leg	42		2			4		0
3	25	FCC of left tibia and fibula	Long leg	42		2			4		0
5	20	FCC of right tibia and fibula	Long leg	28		2			3	Wedged	0
6	25	FCC of left tibia and fibula	Long leg	28		1			3		0
7	31	FCC of left tibia	Long leg	35		1			3		0
8	25	FCC of left tibia and fibula	Long leg	28		2			2		0
10	23	Flexion contracture of left knee and anterio-venous fistula of popliteal artery	Long leg	56		2			3	Wedged	0
13	19	FCC of left tibia and fibula	Long leg	28		2			2		0
14	27	FCC of left tibia and fibula	Long leg	28		2			2		0
15	21	FCC of left tibia and fibula	Long leg	42		2			2	Wedged	0
17	21	FCC of left tibia and fibula	Long leg	28		0			2		0
48	21	FCC of right tibia and fibula	Long leg	28		0			2		0

TABLE 4. *Results obtained with 52 MF-soaked plaster casts**—Continued

Patient	Age (years)	Diagnosis	Type of cast	Time worn (days)	Splints		Rolls			Remarks	Complications
					3 in.	6 in.	3 in.	4 in.	6 in.		
1	28	FCC of right humerus	Shoulder spica	42		4			6		0
4	28	FCC of right humerus, radius, and ulna	Shoulder spica	42		3			6		0
12	28	FCC of right humerus	Shoulder spica	28		2			4		0
16	28	FCC of right humerus, radius, and ulna	Shoulder spica	42		3			4		0
23	30	FCC of right humerus	Shoulder spica	28		2			3		0
27	21	Recurrent dislocation of right shoulder, (Bankhart repair)	Shoulder spica	42		3	2		3		0
32	21	Recurrent dislocation of right shoulder, (Bankhart repair)	Shoulder spica	28		2	2		2		0
46	24	FCC of left humerus	Shoulder spica	42		2	1		2		0
11	18	FSC of medial malleolus	Boot	28		2		3			Dermatitis
25	18	Amputation (Syme's)	Boot	42		1	1		1	Walker	0
33	28	Triple arthrodesis	Boot	28		1	1		1	Walker	0
41	20	Amputation (Syme's)	Boot	42		1	1		1	Walker	0
42	20	Amputation (Syme's)	Boot	28		0	0		1	Mold stump	0

TABLE 4. *Results obtained with 52 MF-soaked plaster casts**—Continued

Patient	Age (years)	Diagnosis	Type of cast	Time worn (days)	Splints		Rolls			Remarks	Complications
					3 in.	6 in.	3 in.	4 in.	6 in.		
43	28	Triple arthrodesis	Boot	42		0	0		1	No walker	0
47	21	FSC of medial malleolus	Boot	42			1		1	Walker	0
9	20	FSC of left humerus FSC of sixth cervical vertebra	Hyperextension arm spica	42		5			10		0
36	45	Spinal fusion	Body and left thigh	56		3	2		4		0
37	23	Spinal fusion	Body	56		2			2		0
38	23	Spinal fusion	Body	28		2			2		0
29	15	Post, poliomyelitic scoliosis Vertebral fusion of third thoracic to second lumbar	Head, body, and left thigh	56		4		5		Hinge wedged	0
20	23	Acromioclavicular separation	Velpeau	42		2			4		0
21	25	Recurrent dislocation of right humerus	Velpeau	42		2			4		0

TABLE 4. *Results obtained with 52 MF-soaked plaster casts**—Continued

Patient	Age (years)	Diagnosis	Type of cast	Time worn (days)	Splints		Rolls			Remarks.	Complications
					3 in.	6 in.	3 in.	4 in.	6 in.		
22	23	Recurrent dislocation of right humerus	Velpeau	42		2			4		0
18	1	Congenital dislocation of hip	Frog leg	28	2		2		2		0
39	5/12	Congenital dislocation of hip	Frog leg	28	2		2		1		0
44	1	Congenital dislocation of hip	Frog leg	28	2		2	1			0
24	21	Fracture of left navicular	Gauntlet	28	1		2				0
28	14	FS of right radius	Long arm	42	1		2				0
34	21	FCC of left radius and ulna	Long arm	28	1		2				0
19	3	Congenital dislocation of hip Open reduction of left hip	Hip spica	28		2		6			0
40	2	Arthroplasty of right hip	Hip spica	14		2		1	3		Dermatitis

TABLE 4. *Results obtained with 52 MF-soaked plaster casts**—Continued

Patient	Age (years)	Diagnosis	Type of cast	Time worn (days)	Splints		Rolls			Remarks	Complications
					3 in.	6 in.	3 in.	4 in.	6 in.		
30	4	Torticollis	Jacket (head and body)	14		2		2	2		Dermatitis
31	5	Torticollis	Jacket (head and body)	14		2	1	1	1		Dermatitis
26	28	Fracture of sixth and seventh cervical and fourth and fifth thoracic vertebras	Minerva	42	2	1	1		2		0
45	20	Fracture of fifth and sixth cervical vertebras	Minerva	42	2	2		1	4		0
49		Median nerve injury	Opponens	56	1	1	1 layer 15 in.				0
50		FS of right radius and ulna	Sugar tong	28	1	2	2 layers 32 in.				0
51		Sprain of wrist	Cock up	56	1		1 layer 15 in.				0
52		FS of radius	Posterior splint	56	1		2 layers 32 in.				0

*Condition on removal of cast was excellent in all patients.
FCC = Fracture, compound, comminuted.
FSC = Fracture, simple, comminuted.
FS = Fracture, simple.

Dermatitis developed in 3 of the 7 children in the series. Patch tests for sensitivity to (a) plaster, (b) MF, and (c) formaldehyde revealed sensitivity for plaster only. As none of these children developed dermatitis on reapplication of casts without MF, it was believed that the lowered porosity of the casts may have been a factor. The 18-year-old patient who developed dermatitis showed a sensitivity to MF.

Removal of the casts both by electric cast cutter and by hand was more difficult because of the hardness. When using MF, extra care should be taken to avoid making casts too heavy. The best use was in casts and splints for long-term wear.

CONCLUSIONS

Plaster of paris soaked in melamine formaldehyde produces a stronger cast with reduced weight and bulk. No change in technic is necessary. The casts produced are superior to ordinary plaster casts in resistance to moisture and soiling. They are satisfactory for wedging in correction of deformities. They are more difficult to remove with hand cutter, cast knife, or electric cutter. MF-plaster residue should not be disposed of in the sink. Dermatitis occurred in 4 of 52 patients, 1 of whom was found to be sensitive to MF.

BOOK REVIEWS

The Moral Theory of Behavior, A New Answer to the Enigma of Mental Illness, by *Frank R. Barta,* M. D., F. A. C. P., Director, Department of Psychiatry and Neurology, Creighton University School of Medicine and St. Joseph's Creighton Memorial Hospital, Omaha, Neb. Publication Number 163, American Lecture Series. A Monograph in American Lectures in Medicine. 35 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $2.

As the title indicates, this monograph deals mostly with the theoretical aspects of mental illness rather than with its practical management. The author believes that without a theoretical framework, the therapist is handicapped in understanding man's basic difficulties in living and is apt to fall back on the more empirical methods of therapy. In a logical and orderly presentation he outlines a theory to explain human behavior (normal and abnormal) based on the philosophy of Aristotle and Aquinas and correlates this not only with the temperamental typologies of Hippocrates, Kretschmer, and Sheldon but also with his own experience in clinical psychiatry. Because the present theory was

first publicly presented in 1948, we cannot but admire the deep convictions that impelled the author to advance his bold thesis on the basis of only 6 years' practice as a licensed physician. Nonetheless, wisdom is not a prerogative of the aged and the author does display great ability as a philosopher. Man's basic relationship is seen as that with God: man's relationships to creatures is viewed in the light of whether he expects too much or too little from others and also whether he expects too much or too little from himself. In this way a tetrachoric correlation is worked out that constitutes the basis for 4 personality types.

The designation of temperament as "learned attitudes" suggests the behavioristic terminology, but this objection is more apparent than real because the author does not use the term temperament (as is usually done in present-day psychology) to denote the innate factors determining a person's basic emotional, physiologic, and kinetic responses. As regards therapy based on this theory, the role of re-education is stressed to the neglect, perhaps, of appreciating the potent emotional factors operative in any patient-physician relationship. The claims of rapid recovery of psychoneurotics after only a few therapeutic sessions should arouse in most psychiatrist a desire for a more detailed account. Unfortunately, this profound thesis with its important implications can scarcely be presented adequately in so brief a monograph. This book will not appeal to those who lack a philosophical bent, but to those who seek a more adequate answer to the meaning of man's existence, it will provide a stimulating and thought-provoking challenge.

—*Capt. J. F. McMullin, MC, USN*

The 1952 Year Book of Pediatrics (June 1951-May 1952), edited by *Sydney S. Gellis*, M. D., Assistant Professor of Pediatrics, Harvard Medical School; Senior Physician, Children's Medical Center, Boston; Pediatrician-in-Chief, Beth Israel Hospital, Boston. *Isaac A. Abt*, M. D., Editor Emeritus. 423 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1952. Price $5.50.

The arrangement of subjects and table of contents of this book has been kept practically the same as in previous years. One improvement made by the new editor is the inclusion of editorial notes with some of the abstracts. These not only give the editor's viewpoint, but also the opinion of experts on the subjects discussed. The illustrations throughout the book are generally excellent. I should like to see chapters on the 2 subjects which now have the highest mortality in infants and children, namely cancer and accidents.—*Captain S. J. Winter, MC, USN.*

ROENTGENOGRAPHIC VISUALIZATION OF THE SPLEEN

PETER ZANCA, *Colonel, MC, U. S. A. (1)*

VISUALIZATION of the shadow of the spleen is successfully accomplished through the use of roentgenographic procedures. The splenic outline and shadow are clearly visualized when a lienographic examination is made with thorotrast or with ethyl diiodostearate and when contrast studies are made following pneumoperitoneum and by extraperitoneal pneumography. Recently Zelman *(2)* has described a simple contrast method for the visualization of the liver and spleen. By increasing the gaseous content of the stomach and injecting air into the colon, sufficient contrast is obtained for the proper visualization of the splenic outline. This is accomplished by giving the patient a glass of carbonated water and by injecting air into the colon through a rectal tube. This, briefly, is Zelman's technic which we have modified and used for the past year at this hospital.

TOPOGRAPHIC ANATOMY

The spleen lies directly under the diaphragm at the level of the ninth, tenth, and eleventh ribs. Anteriorly and medially it is in contact with the greater curvature of the stomach; laterally it extends to the abdominal wall and its inferior margin rests on the splenic flexure of the colon. It varies in size according to the patient's physique but the inferior pole of the spleen reaches the level of the costal margin and it is this portion of the spleen which may be palpable. On the plain roentgenogram of the abdomen it is possible to see the splenic shadow only when the spleen is unduly large or when an impression is made on the gas-filled stomach and on the splenic flexure. In an appreciable number of patients the spleen occupies a lateral position in the left upper abdominal quadrant (fig. 1). The splenic shadow can be visualized on the routine chest film in patients who at the time of examination happen to have a moderate amount of gas in the stomach and in the splenic flexure of the colon (fig. 2).

---

(1) U. S. Army Hospital, Camp Cooke, Calif.

(2) Zelman, S.: Liver and spleen visualization by simple roentgen contrast method. Ann. Int. Med. 34: 466-478, Feb. 1951.

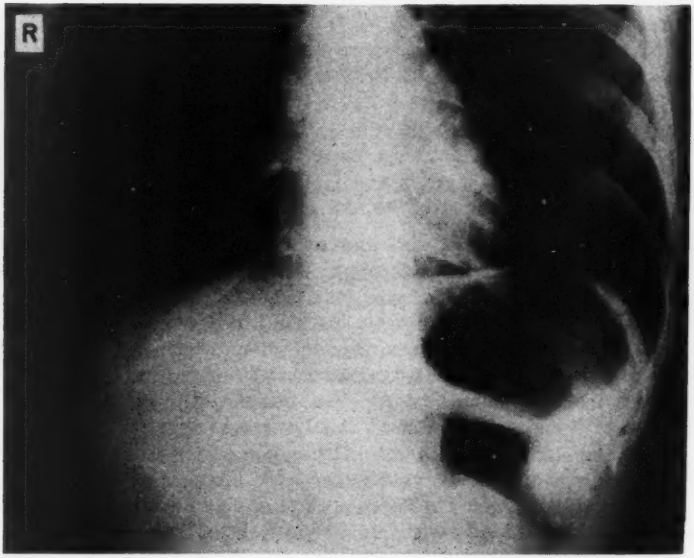


Figure 1. Roentgenogram showing the lateral position occupied by the spleen in the left upper abdominal quadrant.

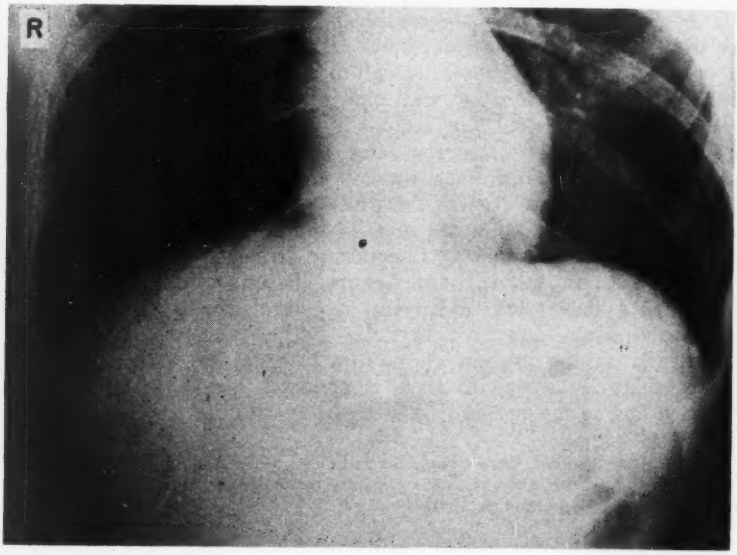


Figure 2. Visualization of the splenic shadow on the routine roentgenogram of the chest.

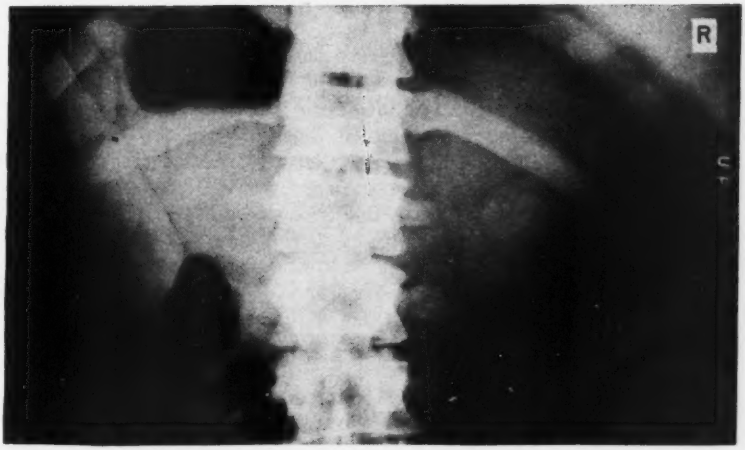


Figure 3. Roentgenogram showing splenic shadow between the stomach and the splenic flexure of the colon.

TECHNIC OF EXAMINATION

The preparation of the patient is that commonly given for the routine barium enema. One ounce of castor oil is given at about 1600 hours on the day prior to the examination. The patient has a light supper and is given a tap-water or normal saline solution enema at 2200 hours. The enema is repeated on the morning

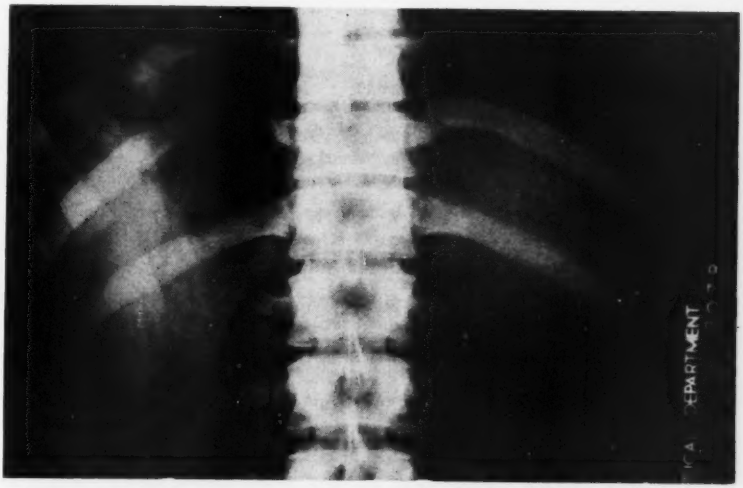


Figure 4. Roentgenogram showing the outline and position of the spleen.

of the examination. The patient reports to the x-ray department at 0800 hours. He is given a glass of carbonated water (Vichy water, Seidlitz powder, or a carbonated beverage). Using a rectal tube and a hand bulb, enough air is injected into the colon under fluoroscopic control to reach just beyond the splenic flexure. Roentgenograms of the abdomen are then taken in the upright (fig. 3) and supine anteroposterior (fig. 4) positions. The left anterior oblique projection (Benassi position) should be used to demonstrate the greater surface of the spleen *(3)*. The technical factors employed are: a target to film distance of 36 inches, a Potter-Bucky diaphragm, 100 milliamperes, 66 kv. for 20-cm. body thickness, and a 3/4-second exposure. The umbilicus is centered to the midline of the cassette and the central ray is directed between the second and third lumbar vertebras. For the oblique view the kilovolts are increased by 4 and the xiphoid process is centered to the midplane of the film. The central ray passes through the center of the film.

Following the above-described technic, we have been able to demonstrate the normal and abnormal splenic shadows.

(3) Merrill, V.: Atlas of Roentgenographic Positions. C. V. Mosby Co., St. Louis, Mo., 1949. vol. 2, p. 537.

BOOK REVIEW

Post-Graduate Lectures on Orthopedic Diagnosis and Indications, Volume IV, by *Arthur Steindler*, M. D., F. A. C. S., Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Iowa. Section A: Arthritis and Diseases of Muscles, Bursae, Tendons, and Fasciae. Section B: Deficiency and Degenerative Diseases of the Locomotor System. 312 pages, illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $9.75.

This volume is a tribute to the author's writing and teaching ability and also to his knowledge of his subject. Section I deals with arthritis and diseases of muscles, bursas, tendons, and fascias; Section II deals with deficiency and degenerative diseases of the locomotor system. Emphasis is on the pathology, clinical signs and symptoms, and treatment for each disease discussed. The photographs and photomicrographs are of excellent quality. Although these lectures are for students of orthopedic surgery, general practitioners, internists, and others called on to treat the above conditions should find this volume to be of great value.—*Lt. Col. R. D. Anderson, MC, USA*

CLINICAL EXAMINATION OF ACUTE TRAUMATIC FACIAL INJURIES[1]

JACK B. CALDWELL, *Colonel, DC, USA* [2]

THE first opportunity for examining acute traumatic facial injuries occurs when the patient is admitted to the receiving ward of a hospital. As a rule, he is first seen by a medical intern or a resident physician. If there is even the slightest evidence of trauma to the face, the skeletal structures should be examined carefully. Internal injuries, fractures, or head injury with brain damage take priority in treatment over accompanying facial injuries. Occasionally trauma to facial bones is underestimated or overlooked altogether because the seriousness of other injuries may take the entire attention of the examining doctor, and because in our trend today toward specialization we have condoned, if not encouraged, younger men to neglect phases of medicine, surgery, or dentistry in which they are not primarily interested. The admitting doctor must accurately evaluate all injuries, including facial, and record his initial clinical impression when the patient is first seen. Based on the results of this first analysis, consultants from appropriate services should be called.

The primary objectives in the treatment of traumatic injuries of the facial bones are: (1) restoration of normal function of the jaws, (2) restoration of normal occlusion of the teeth, (3) prevention of facial disfigurement, and (4) early return of the patient to duty. To attain these objectives, careful treatment planning is essential. To formulate a plan of treatment, accurate diagnoses must first be made. After consideration of emergency treatment, i. e., establishment and assurance of an adequate airway, control of hemorrhage, and treatment of shock, the first step in the diagnosis of traumatic facial injuries is a careful clinical examination. If the admitting physician finds evidence of fractures of the facial bones, he may not wish to complete the examination, but may call for consultation.

---

(1) Presented at the Third Annual Medicomilitary Symposium, U. S. Naval Hospital, Philadelphia, Pa., on 21 October 1952.

(2) Walter Reed Army Hospital, Washington, D. C.

242918 O - 53 - 6

The care of fractures of the facial bones is rarely an emergency and definitive treatment may frequently be deferred for a few days. Occasionally, however, it is advantageous, or necessary, that some form of treatment be accomplished early. Facial deformities, or subsequent reconstructive operations, can be prevented in many instances by early diagnosis and adequate treatment. This can be accomplished only if the examining physician has ascertained the nature and extent of the injury and taken steps to place the patient in the care of the service concerned.

An accurate history is important in establishing a diagnosis and is equally valuable in the evaluation of traumatic injuries. Occasionally it is impossible to obtain a complete history because the patient is unconscious.

VISUAL EXAMINATION

Visual examination may disclose facial deformity caused by swelling from trauma of the soft tissues or the displacement of skeletal structures. This is not a diagnostically reliable sign, however, because edema and cellulitis associated with trauma may be present in the absence of fractures. In fractures with moderate to severe displacement, obvious deformities are diagnostic. Middle facial injuries, for example, frequently produce the gross deformity commonly referred to as "dish face." Depression of the zygoma and fracture of the zygomatic arch are often obvious, but if they are obliterated by swelling, they may be overlooked.

Ocular signs, particularly diplopia, suggest fracture of the maxilla involving the floor of the orbit. Paralysis of the ocular muscles can be caused by a depressed fracture of the zygoma which results in impingement on the third, fourth, or sixth cranial nerve. The presence of cerebrospinal fluid in the nose or ear is an indication of basal skull fracture, usually a result of trauma to the middle face with associated fractures of the maxilla.

Ecchymosis is usually seen adjacent to fractures, but may be present even though fracture has not occurred. Abrasions, contusions, and lacerations of superficial tissues are definite signs of trauma, but are sometimes seen in the absence of fracture. Their presence warrants investigation of underlying skeletal structures.

Occlusion, or malocclusion, is one of the most significant factors in the clinical diagnosis of jaw fractures. Any discrepancy in occlusion, associated with a history of trauma, warrants further investigation. Usually, malocclusion in fractures is sufficiently gross to be obvious, but it is misleading because it may be primary in some cases. Another factor which also may be misleading is the absence of teeth or the presence of grossly carious

or fractured teeth. Laceration of the mucosa with or without the protrusion of bone fragments is an indication of open fracture.

Impairment of function is not present in all patients with fracture of the facial bones, but if present it is usually a reliable sign. The exceptions are trauma to the temporomandibular joint or the muscles of mastication, in which case inflammatory changes and trismus may alter normal function in the absence of fracture. Inability to open the mouth normally, or to close the mouth completely, should always be viewed with suspicion.

DIGITAL EXAMINATION

Marked tenderness over the injured part can be elicited even with gentle palpation. This is an excellent indication of fracture, but it is not diagnostically reliable. Mobility of fractures may be demonstrated by careful examination even in the presence of pain, and, if present at any point in any of the facial bones (except for the temporomandibular joint) may be considered a reliable sign of fracture. Crepitus may be felt during the examination, but it is harmful to manipulate a fracture simply to demonstrate this condition. Loss of contour or disruption of continuity may be felt even in the presence of swelling. This ranks with mobility as a diagnostic sign.

Gross or obvious injuries to the facial bones are almost always recognized. Because more obscure fractures should also be found, this type of injury will be discussed in more detail. If there is any evidence suggesting trauma about the face, even though no gross or obvious evidence of fracture is present, the following procedure is suggested:

1. Using tongue blades to retract the lips, inspect the oral cavity for signs of fracture. Examination of the occlusion is an excellent aid in the clinical diagnosis of fracture of the jaws, but when the patient is instructed to occlude his teeth, he is apt to place them in an incising position, which is not helpful because abnormalities or discrepancies in occlusion will not always be revealed in this way. Therefore, he should be directed to close on his posterior teeth. He will then shift his lower anterior teeth back of the upper teeth and bring all posterior, as well as anterior, teeth into occlusion unless a fracture is present. If there is no visual evidence, proceed with the digital examination.

2. Place the forefinger in the buccal sulcus and palpate gently but firmly along the lateral surface of the body of the mandible. With the other hand, and at the same time, the lower border should be palpated extraorally. Fractures in the body, or at the angle of the mandible, can almost always be felt. If there is any question as to whether a fracture exists, the bone should be grasped

on either side of the suspected break, and with the mouth partially closed, the area in question should be checked for mobility by careful manipulation. It is important that the mouth be partially closed once the hands are in position, so that the muscles will be relaxed, thus permitting an accurate check for movement. This sometimes is difficult to accomplish because the patient, in fear of pain, may resist.

3. Fracture of the condyles may cause a variable amount of swelling anterior to the ear. Function is impaired in that the patient, because of pain, will be unable to open his mouth to a normal degree. Ordinarily there will be deviation to the affected side on opening. Palpation over the joint anterior to the ear may not furnish evidence of fracture except for the complaint of pain which may be present simply because of trauma to the joint capsule. More positive findings may be obtained by palpating bilaterally, with the ends of the little fingers introduced into the ears. As the patient is instructed to open and close his mouth (the excursion need not be wide), inability to palpate the condylar head, inferior to the glenoid fossa, may be significant. Normally the head of the condyle can be felt readily as it comes to rest in the fossa as the mouth is closed.

4. Clinical examination for fracture of the maxilla is similar to that for fracture of the mandible. The forefinger is placed in the superior buccal sulcus and irregularities in contour are sought by palpation. A common location for a fracture line is in the region above the first molar. A discrepancy felt at this point on the zygomatic process of the maxilla is evidence of a fracture of either the maxilla, the zygoma, or both. To determine the exact location, gently but firmly attempt to move the dental arch. If it moves independently of the skull, there is a fracture of the maxilla. The extent can then be determined by roentgenograms.

5. Zygomatic fractures can be felt fairly positively at (a) the zygomaticofrontal suture line lateral to the orbit, (b) along the lower border of the orbit, particularly just above the infraorbital foramen, and (c) in the buccal sulcus at the junction of the zygoma with the maxilla. Occasionally a fracture can be felt at some point along the zygomatic arch.

The securing of posteroanterior and lateral roentgenograms of the skull should *not* be the *initial* procedure when there is a history of trauma to the head or face, or superficial evidence of trauma, such as abrasions, contusions, and minor lacerations. Little information can be gained from these roentgenograms unless fracture is grossly evident. Often a fracture is present, but cannot be seen, or is only sufficiently suggestive to require a re-examination. As a result, no information is obtained, or the information that is gained is questionable and the patient must

again be subjected to movement and positioning for roentgenographic examinations. This may be painful to the patient and may even be dangerous. If, however, a careful clinical examination has been made and a tentative diagnosis established, the various services involved can be called into consultation and an orderly roentgenographic survey undertaken. The patient may, of necessity, have to have more than one series of films, but the need for several trips to the x-ray department can be eliminated if examination of all suspected damage has been carried out initially.

SUMMARY

A careful clinical examination of the facial skeletal structures should be made in all patients if there is history or clinical evidence of trauma. The diagnosis should never be based on roentgenographic reports alone because negative findings do not rule out fractures which, if undiscovered, may result in deformity. Whether the patient's general condition is favorable or not, there should be an immediate consultation for all injuries, including those of concern to the oral surgeon. The decision for the treatment time should rest with the responsible service. Of all deformities, few are of more concern to a patient than those involving his face.

BOOK REVIEWS

Nurses Handbook of Obstetrics, *Louise Zabriskie,* R. N., Formerly Night Supervisor, Lying-In Hospital, New York City, and Field Director, Maternity Center Association, New York City; Director, Maternity Consultation Service, New York, N. Y.; Lecturer in the School of Education, Department of Nurse Education, New York University, New York, N. Y., and *Nicholson J. Eastman,* M. D., Professor of Obstetrics in the Johns Hopkins University and Obstetrician-in-Chief to the Johns Hopkins Hospital. 9th edition, completely revised. 695 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1952.

This volume should be of inestimable value to the student nurse as well as to the graduate on obstetrical duty. It is a complete course in obstetrical nursing, including reviews of anatomy, physiology, and the clinical side of this specialty. There are, at the end of each section, searching examination questions which will insure a careful perusal of the text. Illustrations are liberal and generally clear and up to date. The chapters devoted to the puerperium and the nursing care of the newborn infant are particularly informative and might profitably be read by physicians

and hospital administrators responsible for the functioning of maternity units. There is a complete section devoted to the technic of delivery in the home, an art fortunately on the decline but still practiced, of necessity, in rural areas. The chapter on the mental hygiene of pregnancy is of particular value as it stresses a type of problem frequently encountered, usually not recognized, and often mishandled. Although this volume is of primary interest to nurses, it would also be of practical value to the physician practicing obstetrics in a rural area, or setting up a small obstetrical unit of the type becoming so prevalent with the growth of group practice.

—Commander A. G. Simpson, MC, USN

Understanding Old Age, by *Jeanne G. Gilbert*, Ph. D., Diplomate in Clinical Psychology, American Board of Examiners in Professional Psychology; Lecturer in Psychology, Fordham University Graduate School and Long Island University Graduate School. 422 pages. The Ronald Press Co., New York, N. Y., publishers, 1952. Price $5.

This book is concerned with various physical and psychologic changes generally associated with advanced age. The first part deals with so-called normal changes, i. e., those which can be observed in everyone to some extent. These are discussed under the terms physical, endocrine, emotional, intellectual and motor, and social relations. The second part considers such abnormal changes as common disabling physical conditions, psychoneuroses, and psychoses. The final part deals with practical approaches to professional work with the aging generally, in the community, and in institutions. Name and subject indexes are provided, and extensive bibliographies appear at the end of the chapters.

The exposition is handled skillfully throughout, and there can be little doubt that the author has done a great deal of reading and thinking about aging, but what began as a well-documented factual survey soon deteriorated into uncritical psychoanalytic fancy. One exception to this is the chapter on intellectual and motor changes, in which the major experimental contributions are acknowledged, albeit without critical appraisal. An occasional statement is frankly naive, such as "The individual with a 'neurotic constitution' or neurotic temperament has a hereditary make-up which is sensitive and high-strung, so that he cannot readily withstand the vicissitudes and stresses of life" (p. 235).

I agree with the author that the book may be useful to the physician, the nurse, the social worker, and institutional personnel. Part III especially abounds in common sense. This is not a book for the researcher in gerontology.

—Maj. R. B. Payne, USAF (MSC)

THE RELATIVE EFFICACY OF CULTURES FOR SHIGELLA[1]

ALBERT V. HARDY, *M. D.* [2]
DON MACKEL, *M. S.* [3]
DWIGHT FRAZIER, *M. S.* [3]
DAVID HAMERICK, *Ensign, MSC, USN*

MULTIPLE examinations proved necessary to provide dependable laboratory findings in enteric infections occurring among Korean prisoners of war. Three diagnostic specimens were collected from each patient for bacteriologic examination. In unselected groups of patients these were obtained by different methods, thus providing an opportunity to evaluate the relative efficacy of cultures on passed specimens, material collected by rectal swabs, and that taken during sigmoidoscopic examination.

In the camp where this study was made, amebic dysentery, salmonellosis, and shigellosis were occurring simultaneously. Many persons had been ill for several days before admission to the hospital and shigellas were present in comparatively small numbers in these patients with ulcerative bacillary dysentery. The cultures obtained from them contained a large number of paracolon and proteus organisms which produced colorless colonies on shigella-salmonella (SS) agar. These factors all increased the difficulty of bacteriologic diagnosis but simultaneously provided an unusually valuable series for the study of the relative efficacy of culture procedures.

Patients were admitted to the hospital in the late afternoon. The diagnostic cultures routinely were obtained on the following morning. The men in groups of 5 were given freshly sterilized pans. Fecal specimens were collected and were carried at once to the diagnostic laboratory. Here with little or no delay, an SS

(1) The studies here reported were conducted in Korea by a Joint Dysentery Unit under the sponsorship of the Commission on Enteric Infections of the Armed Forces Epidemiological Board. Those participating in the study in Korea came from the Army Medical Service Graduate School, The Fleet Epidemic Disease Control Unit No. 1, the Microbiological Institute and Communicable Disease Center of the U. S. Public Health Service, the 406th (U. S. Army) Medical General Laboratory, the 64th Field Hospital, the Bureau of Laboratories of the Florida State Board of Health, and Louisiana State University School of Medicine.

(2) Director of Laboratories, Florida State Board of Health.

(3) Bacteriologist, Bureau of Laboratories, Florida State Board of Health.

agar plate was inoculated. Selected purulent exudate was used if present. Within a few minutes to an hour, a second culture was taken by rectal swab and inoculated at once on SS agar. Immediately thereafter each patient was examined sigmoidoscopically and, during this, a swab specimen for bacteriologic examination was obtained from the area of maximum involvement. The 3 cultures were inoculated similarly using 1 plate of SS agar for each. About half of the plate was streaked with the original swab and for better isolation the remainder was cross-streaked with a fresh sterile swab. The cultures had separate identifying numbers and in the laboratory each of the 3 from a given patient was handled as an individual specimen.

During 3 months in 1951, a total of 3,128 patients were examined by the 3 methods described. Shigellas were isolated from 1 or more of the specimens in 893 (28.5 percent) of these. Of the cultures taken during sigmoidoscopic examination, 608 were positive. There was only a little difference in the results by the other 2 technics, the rectal swab yielding 509 positive cultures as compared with 496 from the passed specimens. Of the 893 positive examinations 363 (40.6 percent) were found positive by 1 procedure only (95 by passed specimen only, 98 by rectal swab only, and 170 by sigmoidoscopic swab only). Shigellas were isolated by 2 of the procedures from 307 patients (34.4 percent) and by all 3 in 223 (25 percent).

Heretofore the rectal swab technic has been recommended on the basis of practicability. It may be stressed now that this simple procedure provides results equal to or better than those obtained by a prompt culturing of freshly passed whole fecal specimens. Considering the highly significant time factor it seems apparent that rectal swabs provide substantially more dependable findings in shigellosis than cultures on passed fecal specimens as they are ordinarily collected and submitted. Cultures taken during sigmoidoscopic examination from the area of maximum involvement in the lower bowel yielded about 6 positives for each 5 found by either of the other technics.

Examination by rectal swab has an advantage not indicated by these comparative studies. It is a simple rapid method of obtaining cultures and the test may be repeated without hesitation. On the basis of convenience and reliability, it is a method which may be used without hesitation.

EDITOR'S NOTE: The procedures used will be described in detail in Hardy, A. V.; Mason, R. P.; Hamerick, D.; and Mitchell, R. B.: Bacteriologic diagnosis of enteric infections. To be published in this Journal.

ACUTE LYMPHOCYTIC LEUKEMIA TREATED WITH ACTH

RALPH D. ROSS, *Commander, MC, USN (1)*

GREAT interest has been aroused in the treatment of acute leukemia since ACTH and cortisone have become available. Donald and Higgins *(2)* reported that large doses of ACTH or cortisone showed a suppressing influence on the neoplastic lymphoid tissue of rats which had received an intraperitoneal inoculation with leukemic cells. These hormones did not prevent the development of the leukemia, but appeared to ameliorate the condition and to prolong the survival time slightly. Dobriner et al. *(3)* observed that alterations in adrenal cortical function occurred in patients with lymphoid neoplasms. Dougherty and White *(4)* observed that increased adrenal cortical function in animals resulted in an involution of normal lymphoid tissues. Because of these and other observations, it was suggested that stimulation of the adrenal cortical function with ACTH might favorably influence the course of acute leukemia in man. This form of therapy has been used by numerous groups of workers *(5–18)*, with varying degrees of success. Temporary clinical or hematologic remissions were observed in many of the reported

(1) U. S. Naval Hospital, Oakland, Calif.

(2) Donald, T. C., Jr., and Higgins, G. M.: Effect of high levels of certain steroids on induced lymphocytic leukemia in rat. Cancer Res. 11: 937-942, Dec. 1951.

(3) Dobriner, K.; Lieberman, S.; and Rhoads, C. P.: Excretion in urine of metabolites of adrenal cortical hormones in health and disease, including neoplastic growth. Cancer Res. 7: 711, May 1947.

(4) Dougherty, T. F., and White, A.: Effect of pituitary adrenotropic hormone on lymphoid tissue. Proc. Soc. Exper. Biol. & Med. 53: 132-133, June 1943.

(5) Schulman, L.: Treatment of leukemia with ACTH and cortisone. Am. J. Dis. Child. 80: 521-522, Sept. 1950.

(6) Pearson, O. H., and Eliel, L. P.: Use of pituitary adrenocorticotropic hormone (ACTH) and cortisone in lymphomas and leukemias. J. A. M. A. 144: 1349-1353, Dec. 16, 1950.

(7) Kinsell, L. W.; Rogers, H.; Baker, C.; and Jenkins, B. J.: Monocytic leukemia treated with pituitary adrenocorticotropic hormone (ACTH). J. A. M. A. 144: 617-618, Oct. 21, 1950.

(8) Moody, E. A., and Davis, R. W.: Duration of acute leukemia in children; review of literature and report of case of unusually long survival. Am. J. Dis. Child. 80: 955-962, Dec. 1950.

(9) Cameron, D. G.; Townsend, S. R.; Mills, E. S.; and Mathews, W. H.: ACTH and cortisone in treatment of acute leukemia. Canad. M. A. J. 65: 552-555, Dec. 1951.

(10) Darte, J. M. M.; Snelling, C. E.; Laski, B.; Jackson, S. H.; and Donohue, W. L.: ACTH and cortisone in treatment of leukemia in children. Canad. M. A. J. 65: 560-564, Dec. 1951.

patients. Temporary remissions occurred in about 50 percent of a group of children with acute leukemia treated with ACTH *(10)*. None of the patients in that group, however, could be considered to be cured or permanently benefited, although repeated remissions were obtained in a few of these patients. All eventually became refractory to further hormone therapy. The treatment of acute leukemia with ACTH has been found somewhat more efficacious in children than in adults in the reported series.

Four patients with acute lymphocytic leukemia have been given ACTH at this hospital since June 1951. All had died by 21 November 1952. The purpose of reporting this small group of patients with acute lymphocytic leukemia treated with ACTH is to point out some of the hematologic changes seen, as well as to call attention to the discouraging results obtained in this form of therapy.

Method. This group of patients was given ACTH intravenously. The method used was essentially that described by Renold et al. *(19)*. The drug was given in 1 liter of 5 percent dextrose solution over an 8-hour period each day. The dose was 20 or 25 mg. per day at the beginning of therapy. This was decreased to 5 mg. daily in patients 1, 2, and 3 over a period of time. Patient 4 received 25 mg. daily during the entire course of therapy. Patient 1 developed a clinical relapse shortly after the ACTH was discontinued and 20 mg. daily was given throughout the remainder

---

(11) Farber, S.; Downing, V.; Schwachman, H.; Toch, R.; Appleton, R.; Heald, F.; King, J. P.; and Feriozi, D.: Action of ACTH and cortisone in acute leukemia. In Mote, J. R. (editor): Proceedings of the Second Clinical ACTH Conference. Vol. 2—Therapeutics. The Blakiston Co., Philadelphia, Pa., 1951. pp. 251-288.

(12) Farber, S.; Shwachman, H.; Toch, R.; Downing, V.; Kennedy, B. H.; and Hyde, J.: Effect of ACTH in acute leukemia in childhood. In Mote, J. R. (editor): Proceedings of the First Clinical ACTH Conference. The Blakiston Co., Philadelphia, Pa., 1950. pp. 328-330.

(13) Stickney, J. M.; Heck, F. J.; and Watkins, C. H.: Cortisone and ACTH in management of leukemia and lymphoblastoma. Proc. Staff Meet., Mayo Clin. 25: 488-489, Aug. 16, 1950.

(14) Thorn, G. W.; Forsham, P. H.; Frawley, T. F.; Hill, S. R., Jr.; Roche, M.; Staehelin, D.; and Wilson, D. L.: Medical progress; clinical usefulness of ACTH and cortisone. New England J. Med. 242: 824-834, May 25, 1950.

(15) Saunders, R. H., Jr., and Adams, E.: Changes in circulating leukocytes following administration of adrenal cortex extract (ACE) and adrenocorticotropic hormone (ACTH) in infectious mononucleosis and chronic lymphatic leukemia. Blood 5: 732-741, Aug. 1950.

(16) Pillers, E. M. K.; Burchenal, J. H.; Eliel, L. P.; and Pearson, O. H.: Resistance to corticotropin, cortisone, and folic acid antagonists in leukemia. J. A. M. A. 148: 987-994, Mar. 22, 1952.

(17) Pearson, O. H.; Eliel, L. P.; and Talbot, T. H., Jr.: Use of ACTH and cortisone in neoplastic disease. Bull. New York Acad. Med. 26: 235-239, Apr. 1950.

(18) Spies, T. D.; Stone, R. E.; Lopez, G. G.; Milanes, F.; Toca, R. L.; and Reboredo, A.: Response to adrenocorticotropic hormone and cortisone in persons with carcinoma, leukaemia, and lymphosarcoma. Lancet 2: 241-244, Aug. 12, 1950.

(19) Renold, A. E.; Forsham, P. H.; Maisterrena, J.; and Thorn, G. W.: Intravenously administered ACTH; preliminary report. New England J. Med. 244: 796-798, May 24, 1951.

of his therapy. This group of patients received, in addition to the ACTH, whole blood transfusions, antibiotics, and symptomatic and supportive measures as indicated. No folic acid antagonists were administered to this group of patients.

Clinical material. This group of patients included 1 woman and 3 men whose ages varied from 18 to 28 years. Bone marrow specimens revealed typical features of acute lymphocytic leukemia in all cases, as did the original peripheral blood smears. Anemia was present in all of these patients on admission to the hospital.

CASE REPORTS

Case 1. A 28-year-old man was admitted to the hospital on 10 June 1951. He had enjoyed good health until about 2 months prior to admission when he noted a "loss of vitality," moderate muscular weakness, loss of appetite, low back pain, pain and tenderness over his ribs, and moderate discomfort in his knees. About 1 month prior to admission he noted that his gums bled on slight trauma. At that time he was examined and treated by a dental officer and the gingival bleeding stopped after about 3 weeks. He was told that he appeared pale during the month prior to admission and had had a frontal headache which had progressively increased in severity for 3 weeks before admission. Ten days prior to admission he noted a blurring of vision in his left eye. At that time he was found to have a rather marked anemia and was given 1.5 liters of whole blood, injections of liver extract, iron, and antibiotics. For the 3 weeks prior to admission he had noted that he bruised more easily than previously and had also noted evidence of spontaneous bleeding into the skin without trauma.

On physical examination, he appeared moderately pale. There were numerous ecchymoses in the skin of both forearms and buttocks. A funduscopic examination revealed numerous retinal hemorrhages with a macular hemorrhage on the left (OS 20/400). There was tenderness over the distal end of his sternum and over his ribs. The gingival margins were red, edematous, and boggy, but there was no evidence of bleeding. There was no hepatomegaly or splenomegaly. There were numerous firm, nontender lymph nodes palpable in the cervical, axillary, inguinal, and epitrochlear areas.

A red blood cell count on admission was 3.1 million with 9.5 grams of hemoglobin, and the hematocrit was 29 volumes per 100 cc. A platelet count was 110,000. A leukocyte count was 20,000 with 4 percent neutrophils, 3 percent band forms, 1 percent monocytes, 2 percent eosinophils, and 90 percent lymphocytes of which 31 were blast forms. A bone marrow specimen revealed

a hypercellular marrow of which 50 percent of the cells were reticulum cells and 50 percent were undifferentiated, immature or stem cells of the lymphocytic series (fig. 1). A bone marrow study on 10 July revealed 15 percent undifferentiated blast forms, 22 percent lymphoblasts, 48 percent prolymphocytes, and 12 percent lymphocytes. There was a marked increase in the elements of the lymphocytic series. Elements of the myelocytic series were rarely seen. A diagnosis of acute lymphocytic leukemia was made.

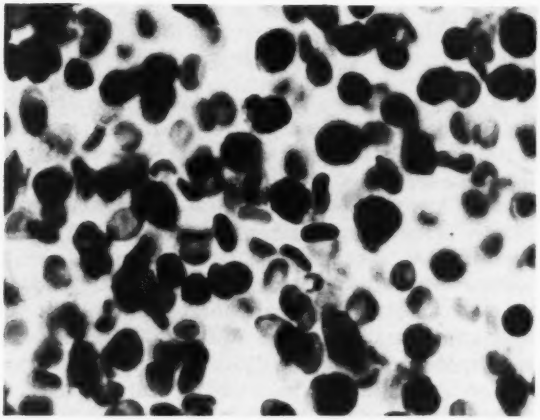


Figure 1. Bone marrow before ACTH therapy. X 970.

Therapy consisted of rest in bed, repeated transfusions of whole blood, ACTH, antibiotics, and symptomatic and supportive measures. Treatment with ACTH was started on 6 July. This was given intravenously in 1 liter of 5 percent dextrose solution over an 8-hour period each day. He was given 20 mg. daily from 6 July to 8 August, then the dose was reduced to 5 mg. daily. This was continued from 11 to 19 August, at which time this therapy was discontinued. On 4 September treatment with 20 mg. of ACTH daily was resumed and continued until his death on 19 October. He received a total of 1,595 mg. of ACTH.

Prior to the ACTH therapy he developed a recurrence of the gingival bleeding, abdominal discomfort, and pain and tenderness over all bones. By the fifth day of ACTH therapy there was marked subjective improvement which continued and became more marked as therapy was continued. His abdominal pain and the osseous pain had cleared by the fifth day of therapy. His appetite improved and by the tenth day all hemorrhagic manifestations had disappeared. After about 15 days of ACTH therapy the immature lymphocytic cells were no longer seen in the peripheral blood smears. He continued to have anemia and he required frequent

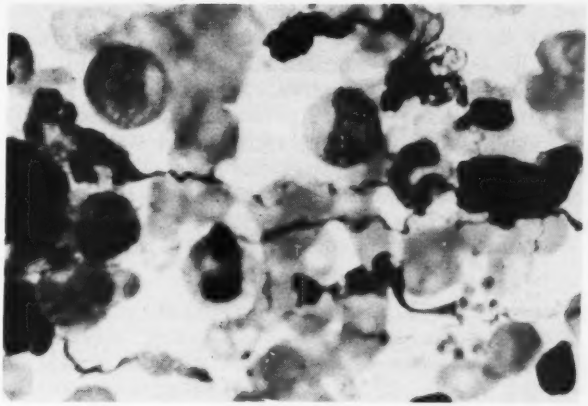


Figure 2. Bone marrow after ACTH therapy. X 970.

whole blood transfusions to maintain a relatively normal red blood cell count and hemoglobin determination. After ACTH therapy, bone marrow studies revealed a marked increase in the myeloid elements, a mild increase in the erythroid elements, a marked decrease in the lymphocytic elements, and an almost complete disappearance of the immature forms (fig. 2).

After the ACTH therapy was discontinued on 19 August he developed a temperature of 102° F., extreme nausea, vomiting, anorexia, generalized muscular weakness, myalgia, and osseous pain. A bone marrow specimen on 4 September revealed a recurrence of the picture of acute lymphocytic leukemia with a predominance of blast and immature forms of the lymphocytic series

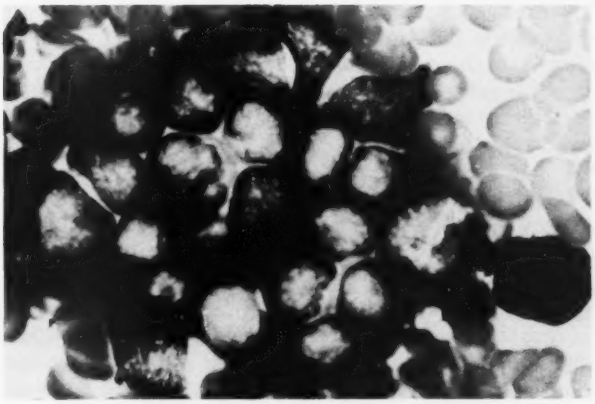


Figure 3. Bone marrow just prior to death. X 970.

(fig. 3). ACTH therapy was resumed on 4 September. His appetite improved but he continued to have myalgia, arthralgia, and osseous pain. Radiographic examinations of all painful bones and joints were consistently negative. By 1 October his muscular strength had decreased markedly and his hospital course from that time was progressively downhill. On 18 October he became irrational, restless, and he recognized none of his surroundings. He had two convulsive seizures at that time and he then became comatose. He died a few hours later (fig. 4).

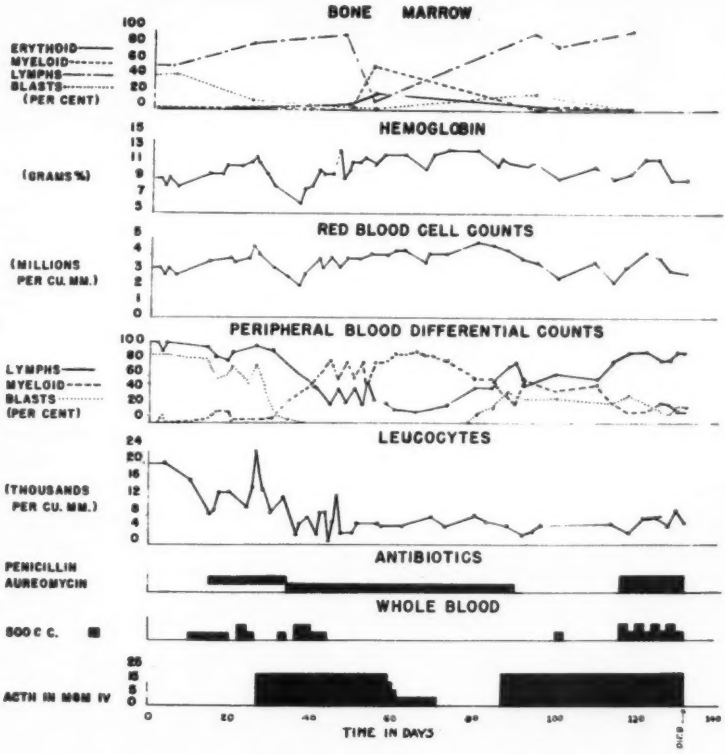


Figure 4. Hematologic findings and treatment in patient 1.

Autopsy revealed petechial hemorrhages in the skin and mucosa; leukemic infiltrations in the lymph nodes, spleen, liver, bone marrow, and dura mater; subendocardial and subepicardial hemorrhages; subperiosteal hemorrhages of the sternum and ribs; hypertrophy of the adrenal glands (cortexes); and moderate hypertrophy of the pituitary gland.

Case 2. An 18-year-old man was admitted to the sick list aboard ship on 29 July 1951 and was admitted to this hospital on 14 August. At the time of his admission to the sick list he complained of easy fatigability, weakness, lethargy, dizziness, malaise, abdominal distention, tarry stools, bloody urine, yellow discoloration of the skin and scleras, bleeding and soreness of the gums, and a weight loss of 20 lb. He had enjoyed good health until May. His fatigability, weakness, and lethargy had become progressively more severe. His shipmates had informed him that he appeared pale.

The physical examination at the time of his admission to this hospital revealed generalized weakness, moderate cachexia, a moderate icteric tinge to the skin and scleras, a moderate generalized lymphadenopathy, crusted lesions of the buccal mucosa and gums with a tendency to bleed, a marked pallor of the skin and mucosa, and numerous ecchymoses and petechias over the trunk and extremities. The liver edge was palpable 6 cm. below the right costal margin and was exquisitely tender. The spleen was palpable 5 cm. below the left costal margin.

His leukocyte count was 3,050 with 80 percent lymphocytes, 17 percent neutrophils, and 3 percent blast forms. His red blood cell count was 4.2 million; his hemoglobin was 12.5 grams; and his hematocrit was 35 volumes per 100 cc. His platelet count was 47,000. His sedimentation rate was 52. A urinalysis revealed many red blood cells on microscopic examination. A serum bilirubin test revealed 4 mg. per 100 cc. in 1 minute and 6 mg. per 100 cc. in 30 minutes. A thymol turbidity test was 9 units. His prothrombin level determination was 34 percent. His coagulation time was 16 minutes and 45 seconds (Lee-White). His A/G ratio was 0.67:1 with a normal total protein determination. His alpha globulin was 2.30 and his gamma globulin, 2.25 grams per 100 cc. A bone marrow specimen taken prior to his arrival here revealed that the normal marrow elements were largely replaced by cells of the lymphocytic series in all phases of maturation, varying from blast forms to mature lymphocytes with a marked predominance of immature forms, and a diagnosis of aleukemic lymphatic leukemia had been made. A sternal marrow specimen taken at this hospital on admission here confirmed the above impression.

From the time of his admission to the sick list and prior to his admission to this hospital he had been given numerous whole blood transfusions in order to maintain a relatively normal red blood cell count and hematocrit level. In this hospital he was given whole blood transfusions in amounts sufficient to maintain his hematocrit above 35. He was given 25 mg. of ACTH intravenously every day for 22 days, after which the dose was gradually

decreased over a 14-day period and then this treatment was discontinued. Following this course of ACTH the patient showed marked subjective improvement and a marked reduction in the hepatomegaly, lymphadenopathy, and hemorrhagic tendency. About 1 week after the institution of this therapy his jaundice disappeared and his strength improved. He developed a large abscess on the right leg which was incised and drained. With antibiotic therapy there was gradual but progressive improvement. After the ACTH therapy was discontinued his symptoms recurred and he developed pain in all extremities and in the right upper abdominal quadrant. There was a recurrence of the hepatomegaly.

On 10 October ACTH therapy with 25 mg. daily was again started. On this regimen the liver and spleen again regressed in size and by 7 November were not palpable. By the middle of November he displayed marked weakness and his abdomen became markedly distended. His liver and spleen enlarged rapidly at that time. On 27 November the ACTH therapy was discontinued. By 28 November he was rapidly losing ground. He developed ecchymoses over the entire trunk and extremities. He vomited frequently and bled from the gums and nose. Frequent transfusions were administered. During his period of hospitalization he received a total of 16.5 liters of whole blood. On 3 December 1951 his leukocyte count suddenly rose to 56,000 with 98 percent lymphocytes including numerous immature forms. At that time his liver was exquisitely tender and was palpable 3 cm. below the level of the umbilicus and his spleen was enlarged to the level of the umbilicus. On 7 December his leukocyte count was 10,000 with 100 percent lymphocytes. There was evidence of a moderate anemia. He required large doses of opiates. On 8 December he developed fever and a moderate cyanosis. On 9 December he became dyspneic and cyanotic and died (fig. 5). No autopsy was performed.

Case 3. A 23-year-old woman was admitted to this hospital on 2 August 1951 complaining of easy fatigability of 1-month duration and amenorrhea since 26 April. She had enjoyed good health prior to the onset which was accompanied by some nausea and occasional vomiting, which she attributed to her early pregnancy. She had noted occasional nose bleeds and bleeding of the gums on brushing the teeth during the preceding months. She believed that she bruised more easily than other people and had often noted black and blue spots on her thighs where she sustained trauma.

Physical examination on admission revealed a rather marked pallor. Her temperature was 99.2° F. There was a small area of bluish discoloration of the skin over the lateral aspect of her left thigh. A funduscopic examination revealed 2 small areas

of retinal hemorrhage on the left and 1 on the right. There were numerous small, shotty, nontender, cervical, axillary, and inguinal lymph nodes. Her spleen was enlarged to 1 cm. below the level of the umbilicus and was nontender. A pelvic examination revealed a 3-month intrauterine pregnancy.

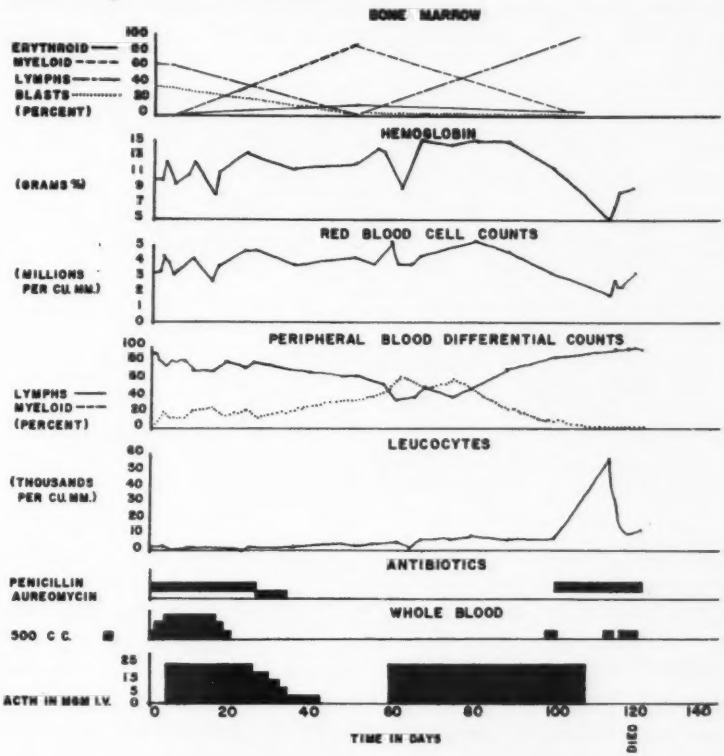


Figure 5. Hematologic findings and treatment in patient 2.

Her red blood cell count was 1,610,000. Her hemoglobin was 4.75 grams. Her leukocyte count was 67,600 with 99 percent lymphocytes including many early blast forms. A bone marrow specimen revealed a nearly complete replacement of the normal elements by cells of the lymphocytic series with many immature forms (fig. 6).

She was given 20 mg. of ACTH daily. After 3 days of therapy her red blood cell count was 700,000 and after 5 days her leukocyte count dropped to 650, whereupon the ACTH therapy was discontinued for 8 days, during which time she was given a

242918 O - 53 - 7

total of 4 liters of whole blood. She was also given antibiotics for an exudative tonsillitis. Her leukocyte count increased to 5,400 with 37 percent segmented forms and ACTH therapy was reinstituted on 30 August. Her sedimentation rate dropped from 42 to 2. Her spleen gradually decreased in size and by 15 September was not palpable. Bone marrow specimens taken on 5 September and 1 October revealed findings suggestive of a chronic leukemia, whereas prior to therapy the findings were

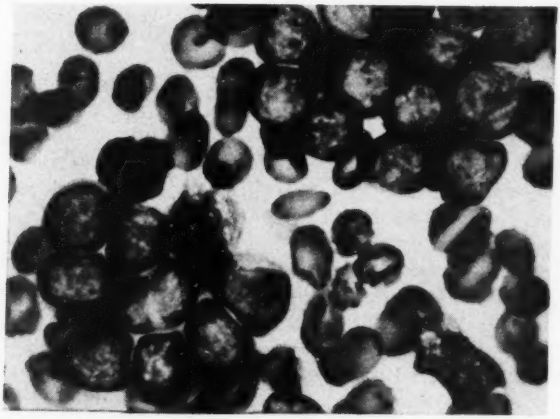


Figure 6. Bone marrow before ACTH therapy. X 970.

those of an acute lymphocytic leukemia. There was a definite increase in the myelocytic elements in the bone marrow and a normal number of megakaryocytes appeared after she had been on ACTH therapy. She developed a moderate facial acne which persisted throughout treatment.

After a few weeks of ACTH therapy her hematologic findings remained stationary and normal until 25 December 1951 when she developed a temperature of 102° F., a suboccipital headache, mild to moderate abdominal cramps, and chills. These symptoms persisted throughout the night and at 0800 on 26 December she delivered a macerated fetus of about 5½ months' gestation. Ten minutes later the placenta was delivered intact and there was a blood loss of about 50 ml. Her postpartum course was uneventful and she became afebrile within 48 hours. She was given a total of 1,080 mg. of ACTH during the course of therapy. The daily dose of ACTH was reduced to 5 mg., on which regimen she remained until she was discharged from the hospital on 19 January 1952.

She was followed as an outpatient and on 30 April a bone marrow specimen was normal (fig. 7). On 1 June there had been no recurrence of splenomegaly, hepatomegaly, or adenopathy (fig. 8).

She remained in a clinical and hematologic remission until 4 August when she was found to have a hematologic recurrence of the acute lymphocytic leukemia. The bone marrow specimen revealed that nearly all of the bone marrow elements had been replaced by immature lymphocytic cells. Only occasional erythrocytic and myelocytic elements were seen. Megakaryocytes were rare in the bone marrow smears. The biopsy findings were essentially those seen at the time of her original admission 1 year earlier. Her

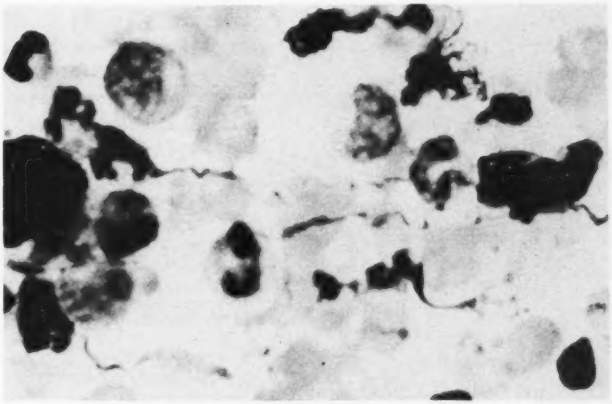


Figure 7. Bone marrow after ACTH therapy. X 970.

leukocyte count was 35,000 with a predominance of lymphocytes, 30 percent of which were immature forms. She was readmitted to the hospital on 4 August and given 20 mg. of ACTH in 1,000 cc. of 5 percent dextrose intravenously over an 8-hour period each day. The daily dose of ACTH was gradually reduced to 5 mg. On this regimen of therapy she remained afebrile and asymptomatic. Her leukocyte count returned to normal, but there continued to be a predominance of lymphocytes.

A bone marrow specimen taken on 15 September revealed a hypercellular marrow and about 80 percent of the nucleated cells were of the lymphocytic series of which 20 percent were immature forms. Erythroid and granulocytic elements were present in all stages of development although they were diminished in quantity. Megakaryocytes were seen in the bone marrow smears but less frequently than normal. This patient was given 100 mg. of cortisone daily by mouth and the ACTH was discontinued. On this regimen she remained asymptomatic and her hematologic findings remained essentially unchanged until 17 November when she developed a sore throat, muscular weakness, chills, fever, and loss of appetite.

Examination at that time revealed a moderate pallor, a temperature of 103° F. and a pulse rate of 110. There was increased generalized lymphadenopathy. The liver was enlarged 2.5 cm. below the right costal margin and was not tender. The spleen was enlarged 5 cm. below the left costal margin and was moderately tender. There was evidence of an acute tonsillitis and acute pharyngitis. The patient was moderately anemic. Her leukocyte

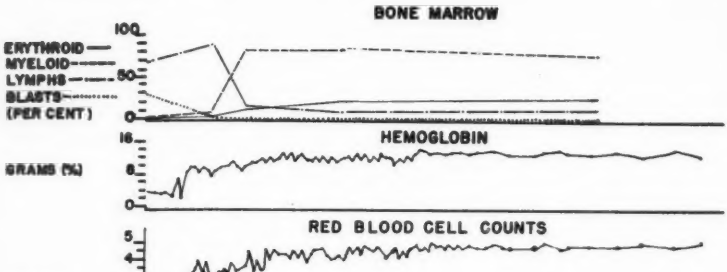


Figure 8. Hematologic findings and treatment in patient 3.

count was 2,900 with 95 percent lymphocytes, most of which were immature forms. She was given massive doses of antibiotics, whole blood transfusions, and cortisone and symptomatic and supportive measures were used. In spite of this she continued to run a febrile course. She became comatose on 20 November and developed a pulse rate of 180. She died on 21 November, 478 days after her original admission to this hospital.

A postmortem examination revealed diffuse enlargement of the cervical lymph nodes. There was evidence of a recent pulmonary

infarction in the lower lobe of the right lung. There was extensive pulmonary edema. The hilar lymph nodes were enlarged bilaterally. The liver was enlarged, weighed 2,850 grams, and contained numerous leukemic infiltrations throughout its substance. The spleen weighed 604 grams. There was evidence of adrenal cortical hypertrophy. A small active duodenal ulcer was noted. There was mild hyperemia of the brain but no evidence of hemorrhage. Leukemic infiltrations involved several organ systems.

Case 4. A 21-year-old man was admitted to this hospital on 6 September 1951. He had enjoyed good health until about 2 weeks prior to admission, at which time he developed a severe sore throat, muscular weakness, and general malaise. He was given penicillin intramuscularly and symptomatic treatment. His symptoms completely disappeared. He felt well after recovery from that illness until 24 hours before admission, when he suddenly developed a severe persistent cramping lower abdominal pain, chills, fever (104° F.), general malaise, and muscular weakness. He had lost about 10 lb. in the 2 months prior to admission. He had noted pallor of the skin and mucosa and a questionable yellowish tinge to the scleras and skin in the 3 weeks prior to admission.

On admission his temperature was 100.2° F. His skin was pale and slightly icteric. There were numerous discrete, nontender, pea-sized lymph nodes. There was moderate lower abdominal tenderness on deep palpation without signs of peritoneal irritation. The spleen was palpable 2 cm. below the left costal margin and was mildly tender.

His leukocyte count was 6,600 with 92 percent lymphocytes (mostly immature forms). The red blood cell count was 1.5 million and the hemoglobin was 5. A bone marrow specimen taken on admission revealed 18 percent blast forms, 59 percent early prolymphoblasts, and 16 percent lymphocytes which were very large and immature. Very few platelets were seen. The findings were consistent with a diagnosis of acute lymphocytic leukemia. Leukocyte counts taken after his admission varied from 7,000 to 12,150 with cells of the lymphocytic series (mostly immature forms) predominating.

He was given numerous whole blood transfusions and antibiotic therapy which resulted in mild subjective improvement. On 8 September treatment with 25 mg. of ACTH daily was started. This was continued until 13 February 1952, during which time he received a total of 3.85 grams of ACTH. After 7 days of ACTH therapy his symptoms had greatly improved and he was able to be up and around. After 2 weeks of ACTH therapy his spleen was no longer palpable and his body weight had returned to

normal. After 3 weeks of treatment he developed a mild facial acne, some mooning of the facies, and a mild euphoria. After 1 month of therapy he developed moderate bleeding from his left ear, small ecchymotic areas in the skin, and small petechias in the mucosa. A sternal bone marrow specimen on 4 October revealed a predominance of immature lymphocytes but there was evidence of substantial myelogenous regeneration. A subsequent bone marrow specimen was relatively normal, most of the cells being of the granulocytic series.

On 14 October he developed an acute tonsillitis which responded well to antibiotics and symptomatic treatment. He subsequently developed abscesses over the temporal area and both buttocks and thighs which required drainage. By 31 October he began to note a recurrence of muscular weakness and fatigability. At that time he developed pain, cramping, and spasm of the calf muscles. This was followed by generalized muscular aching and cramping which continued throughout the remainder of his period of hospitalization. He remained ambulatory during this period in spite of his symptoms. By 1 January 1952 he developed periods of rather marked depression and on several occasions he threatened suicide. He had hallucinations and paranoid ideas. There were occasional remissions of mental symptoms. His body weight decreased appreciably. A bone marrow specimen on 7 February revealed that nearly all of the marrow elements were of the granulocytic series and the vast majority of the cells were at the myelocytic and promyelocytic stage. A few of the myelocytic cells showed maturation as far as stab forms. There was marked hypoplasia of the erythroid elements. Only rare lymphocytic elements were noted and those seen were mostly mature forms. No megakaryocytes were seen. The bone marrow findings at that time were not those of a lymphocytic leukemia, but of an extreme myelocytic hyperplasia and erythrocytic hypoplasia.

On 7 February he began having recurrent episodes of severe epistaxis which were controlled with difficulty and he was given repeated whole blood transfusions as well as nasal packs. His course was progressively downhill and the ACTH therapy was discontinued on 13 February. After ACTH therapy was started the leukocyte counts ranged from 1,850 to 12,700 and revealed a definite decrease in the number of immature lymphocytes and a tendency toward a more normal differential count. On 21 February periods of coma and delirium appeared and his temperature rose to 105° F. He later developed marked hallucinations, then went into a deep coma, and died on 25 February (fig. 9).

Autopsy revealed numerous petechial hemorrhages in the skin and nasal, gastric, and urinary vesicular mucosa. There was

moderate hypertrophy of the adrenal glands (cortexes). The pituitary gland was pale and firm. There was generalized edema, a bilateral patchy pneumonitis, fatty metamorphosis of the liver, and an abscess on the right thigh.

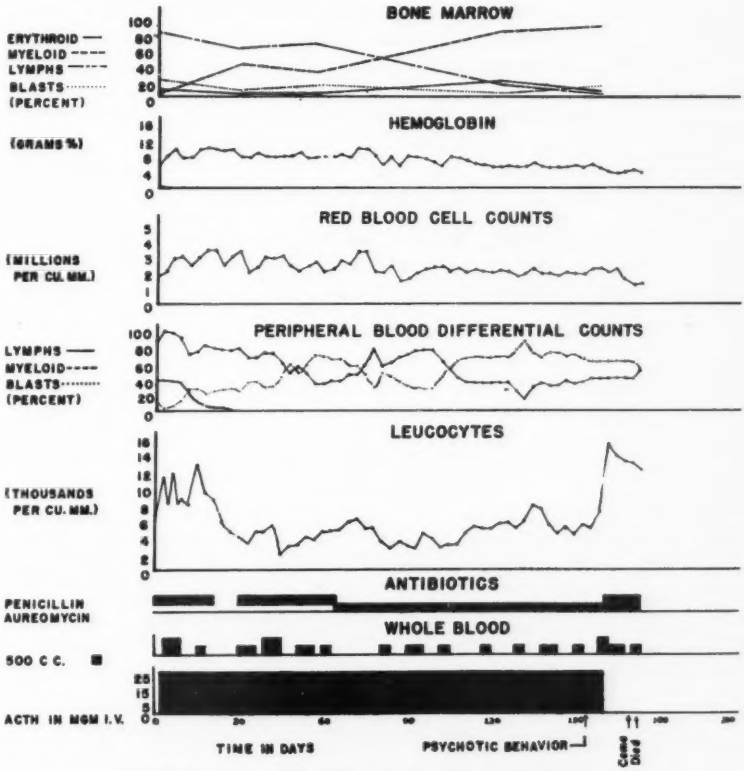


Figure 9. Hematologic findings and treatment in patient 4.

DISCUSSION

The average duration of life in adult patients with untreated acute leukemia is usually less than 2 months. Few live as long as 6 months *(9)*. On rare occasions temporary, spontaneous remissions have been observed.

In addition to ACTH, the patients here reported were given whole blood, antibiotics, and symptomatic and supportive treatment. Folic acid antagonists were not used. Because of the combined form of therapy used in this group, it is difficult ac-

curately to evaluate the effectiveness of ACTH in the treatment of acute lymphocytic leukemia. The period from admission to the hospital until death was 4 months and 9 days, 4 months and 10 days, 5 months and 19 days, and 1 year, 3 months, and 19 days in the patients here reported. A normal number of megakaryocytes reappeared in the bone marrow of patient 3 after ACTH therapy. This was not observed in the other 3 patients in this group. There was moderate improvement of signs and symptoms in all 4 patients for varying periods of time on ACTH therapy. Temporary hematologic remissions were observed in the course of therapy. All patients displayed evidence of refractoriness to the hormone therapy. The psychotic behavior which developed terminally in one patient was not definitely attributed to the hormone therapy.

ACTH will not bring about a permanent cure of acute lymphocytic leukemia, but is a valuable adjunct to our present armamentarium for the treatment of this disease.

BOOK REVIEW

1952 Year Book of Obstetrics and Gynecology (July 1951-June 1952), edited by *J. P. Greenhill,* B. S., M. D., F. A. C. S., Professor of Gynecology, Cook County Graduate School of Medicine; Attending Gynecologist, Cook County Hospital; Attending Obstetrician and Gynecologist, Michael Reese Hospital; Associate Staff, Chicago Lying-in Hospital; Author of Office Gynecology, Obstetrics in General Practice and Principles and Practice of Obstetrics. 575 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1952. Price $5.50.

This book adheres to the plan of organization used in previous years, being about equally divided between obstetrics and gynecology. The two main divisions are subdivided to cover all of the phases of both fields with the possible exception of female urology. It provides an excellent guide and coverage of the outstanding articles of the world literature, well abstracted with the main thesis of each article well and clearly stated, enabling the reader to obtain a good grasp of the trends of practice, thinking, and research from the major clinics and schools of the Western World at least, and even an occasional flash from behind the various curtains. To the military medical officer particularly interested in the field, it is a handy reference providing good coverage of a volume of literature more extensive than he could possibly hope to read for himself. Dr. Greenhill's editorial comments are timely, and usually tolerant, but with sufficient disagreement to be stimulating.—*Lt. Comdr. J. A. Pease, MC, USN*

ACUTE TORSION OF THE GALLBLADDER[1]

LAWRENCE L. BEAN, *Captain, MC, USN*

DAVID A. SYMOND, *Lieutenant, junior grade, MC, USN*

WE have observed a new case of acute torsion of the gallbladder occurring in a 21-year-old man. The youngest male patient with this condition heretofore reported was 38 years old (2). Recht (3) collected a total of 95 cases and added one of his own in a double gallbladder. Cases not included in his collection have been reported (2, 4, 5) bringing the total up to 100.

Anatomically, one of two rare variants must obtain in order that gallbladder torsion may occur. Either the organ must be completely peritonealized, i. e., hanging free in the abdominal cavity from a stalk containing its cystic duct and vessels, or its fundus must be completely peritonealized with the proximal body of the gallbladder affixed, along its length, to the liver bed by mesentery. In the latter case, axial rotation may effect the acute torsion. About 90 percent of the cases reported have occurred in healthy, thin, splanchnoptotic women usually in the 60- to 80-year age group. The first reported case of torsion occurred in a 23-year-old woman (6). One case has been reported in an 11-year-old girl. This preponderant occurrence in women has not been adequately explained. The loss of supportive visceral fat, as well as the loss of tissue elasticity in elderly patients, has been assumed to be responsible for the occurrence of the onset late in life in most cases.

In attempting to evolve a typical syndrome to aid in preoperative diagnosis, most authors admit failure. The early nontoxic appearance of a patient with marked definite localized pain and

---

(1) U. S. Naval Hospital, Great Lakes, Ill.

(2) Case, T. C.: Acute torsion of gallbladder. Am. J. Surg. 82: 749-753, Dec. 1951.

(3) Recht, W.: Torsion of double gallbladder; report of case and review of literature. Brit. J. Surg. 39: 342-344, Jan. 1952.

(4) Peck, M. E., and Feehan, J. J., Jr.: Acute torsion of gallbladder. Surg. 27: 423-426, Mar. 1950.

(5) Vynalek, W. J., and Paloucek, F. P.: Torsion of gallbladder. Illinois M. J. 99: 268-269, May 1951.

(6) Wendel, A. V.: Case of floating gallbladder and kidney complicated by cholelithiasis with perforation of gallbladder. Am. Surg. 27: 199, 1898.

tenderness should arouse suspicion of acute torsion of the gallbladder (*2*). The presence of boardlike rigidity and exquisite tenderness of the epigastrium, concomitant with a soft, nontender hypogastrium was the most striking finding in the patient herein reported. Most of the preoperative diagnoses in the past have been either of perforated duodenal ulcer or of acute appendicitis. Fortunately both diagnoses have led to early surgical intervention which is of lifesaving importance in this condition.

CASE REPORT

A 21-year-old man had been in excellent health until 3 hours before entry, at which time he noted a gradual but fairly abrupt onset of cramplike epigastric pain. At the time of the onset he was riding on a bus, having eaten a light meal about 45 minutes previously. His pain persisted for about 10 minutes, subsided for a few minutes, and then abruptly returned. Soon, however, the pain became steady, nonradiating, and very severe, causing the patient to double up. It persisted, and was present at the time of admission. There had been no nausea, vomiting, chills, abnormal stools, anorexia, or urinary complaints. There was no history of previous similar episodes, preprandial epigastric distress, jaundice, recent food or drink excess, food intolerance, or trauma.

On admission the patient's temperature was 97° F. and his pulse was 60. His epigastrium was boardlike, and exquisitely tender but his hypogastrium was soft and nontender. Just above his right costal margin, when he was sitting upright, percussion gave a hyperresonant note. He had no tenderness in the costovertebral angle. Roentgenograms taken in the supine, upright, and left lateral decubitus positions revealed no free air in the peritoneal cavity, but a moderate amount of air was present within the duodenal loop.

About 5 hours after the onset the patient was taken to surgery with a tentative diagnosis of perforated duodenal ulcer. On opening the abdomen through a right rectus incision, a large dark, gangrenous gallbladder was seen. It was long and thin, with hardly any attachment to the liver. It had twisted completely on itself in a counterclockwise fashion causing the apparent strangulation and infarction of the entire gallbladder wall. The cystic duct and artery were separately ligated, and the gallbladder removed. A drain was placed down to the cystic stump through a stab wound in the flank, and the abdomen closed. The gallbladder contained thick bile but no stones. The mucosa appeared gangrenous.

The pathologist reported the gallbladder to be almost completely covered with peritoneum and to measure 7 by 3 cm. The wall was thickened and extensively hemorrhagic. Microscopically

there was irregular autolysis of the mucosa and some hypertrophy of the muscle. Throughout the sections there was extensive hemorrhage and vascular distention. The cystic artery was not thrombosed. The final diagnosis was venous infarction of the gallbladder. The patient made a rapid and uneventful recovery.

BOOK REVIEWS

The National Health Service in Great Britain, An Historical and Descriptive Study, by *James Stirling Ross.* 398 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1952. Price $7.

The social betterment of a nation and its relation to the medical practitioners is an important issue today in the United States. In order better to understand the issues of "socialized medicine" many fine articles have been written by lay and professional writers, but few physicians read the lay reports or hear any but our own version of Great Britain's National Health Service. This book presents the background and reasons that the Britains and Scots accepted, even demanded, better health services. The deep chasms separating the poor from the upper and middle classes in the Victorian era later brought demands for drastic social improvement. The acceptance of these reforms as an economic necessity soon made it apparent that health as well as education, social security, and productivity were equally vital to the national well-being of Britain.

From the early public health concepts of the late nineteenth century to World War II there was a gradual realization that clinical medicine should somehow become a universally available service. With the selective service statistics and dislocation of urban dwellers to the country due to bombings of World War II, the deplorable state of health became apparent to all. Even during Britain's darkest hours, parlimentary debates on the National Health Service were taking place. This written report of the organization, operations, results, and, particularly, the problems of the National Health Service are chronologically and clearly presented. The operation of the plan from 1948 to 1952 is clearly and forcefully presented. Most of the volume is directed to the medical service in hospitals and general medical practice, but there are chapters on dental, nursing, pharmaceutic, and the administrative functions, both voluntary and governmental. The National Health Service in Scotland is also discussed. Finally, the future policy and very frank discussions of costs and budgets

form a comparative measure of the price a nation must be prepared to pay for a national health service.

In consideration of any social reforms affecting medical practice in the United States, this material is invaluable. It needs the supplement of sufficient professional opinions on what the physician, dentist, pharmacist, and others have determined about the advantages and, particularly, the disadvantages of socialized medicine as practiced under the British system. Certain opinions from this country are discussed in Mr. Ross' book, but it is important for all our medical men to be fully informed on the causes, direction, and future of this radical change in the traditional doctor-patient relationship.

—Col. G. L. Orth, MC, USA

Psychology of Physical Illness, Psychiatry Applied to Medicine, Surgery, and the Specialties, edited by *Leopold Bellak,* M. D., Clinical Assistant Professor of Psychiatry, New York Medical College, Flower and Fifth Avenue Hospitals, New York, N. Y. 243 pages. Grune & Stratton, Inc., New York, N. Y., publishers, 1952. Price $5.50.

The 15 chapters of this book are so organized as to present the psychologic implications of the most common medical and surgical diseases. Furthermore, the psychogenic aspects of somatic complaints are discussed for convenience of organization and because psychosomatic and somatopsychic problems often interact. The introduction briefly and clearly summarizes the modern approach to medicine which views the person as an entity and does not separate the body's response to trauma, infection, and general stress from its reaction to psychogenic stimuli.

Each chapter is written by a different clinician. The chapters include psychiatric considerations as applied to general practice, internal medicine, problems of malignancy, general surgery, plastic surgery, gynecology and obstetrics, diseases of the genitourinary system, rehabilitation and orthopedics, diseases of ear and nose and throat, neurologic disease, pediatrics, dermatology, and dentistry, as well as an enlightening final chapter on the personality of the physician as a liability or an asset. The type of material found in this book should be added to the purely organic discussions of disease usually found in standard textbooks of medicine and surgery.

Because of its broad applicability to all branches of medicine and surgery, this book should be read thoroughly by all practitioners of medicine, regardless of specialty, as it condenses in a small volume the psychiatric implications of the major organic diseases. The book is beautifully bound in water-repellent cloth.

—Col. F. R. Drake, MC, USA

EVALUATION OF THE PHYSICAL FITNESS OF PRESENT-DAY INDUCTEES

BERNARD D. KARPINOS, *Ph. D.* (1)

EARLY in 1944, the U. S. Army adopted a profiling system to evaluate the physical capacities of men entering the military service. In its broad aspect, the profile system was designed to serve as an additional means for properly allocating and using manpower within the Army. The need for definite criteria which could serve as a basis for an effective assessment of a person's qualities in relation to his prospective job assignments in the military service had been fully recognized by the Army since the beginning of World War II. It had, however, been believed that a person's occupational specialty alone was sufficient to accomplish the desired optimum use of manpower. A person's occupational skill and intelligence level were therefore the sole criteria for job assignment, and until 1944 there was no system within the Army to classify a person's physical capacities. This led eventually to a critical qualitative maldistribution of men among the various components of the Armed Forces, by which the Army Ground Forces were most unfavorably affected.

During World War II the United States Armed Forces consisted of 2 major departments: the Navy (including the Marine Corps and Coast Guard) and the Army (including Ground Force, Air Force (2), and Service Forces). A keen rivalry for manpower prevailed during World War II between the Army and the Navy, and simultaneously among the 3 major commands within the Army.

The Army and the Navy competed for manpower through voluntary enlistments. Until the end of 1942, men liable for induction under the Selective Service Act of 1940 were allowed to volunteer for enlistment in the service of their liking. Both the Army and the Navy conducted extensive recruiting campaigns to secure volunteers. As an inducement, the Army offered to its volunteers a choice of assignment within the Army. Most of the volunteers chose the more "appealing" Air Force. Thus, the Ground Force

(1) Medical Statistics Division, Surgeon General's Office, Department of the Army.
(2) The Air Force became an independent department in September 1947.

and the Service Forces had to depend primarily on men inducted through the Selective Service System. The physical and mental standards for enlistment, especially those of the Navy and of the Air Force, were higher than the general requirements for induction. The result was that the Navy and the Air Force were able to obtain men of better caliber, from a physical and mental viewpoint *(3)*.

If the Ground Force fared poorly in the competition for enlistments, they fared no better in their competition with the Service Forces for the qualitative allocation of inductees. Because occupational skill was the primary determining factor in job assignment, men who came into the Army with any sort of previous occupational training tended to be assigned to the Service Forces and the Ground Force obtained what was left. It thus developed that men of high physical stamina were assigned to noncombatant jobs where a high degree of physical fitness was not the primary need and the Ground Force, needing men for combat duty, were receiving proportionally more men who were physically and mentally inferior. Furthermore, all Army personnel were eligible to apply for Aviation Cadet Training or for the Army Specialized Training Program. This further depleted, from a qualitative standpoint, the ranks of the Ground Force.

The inadequacy of this type of distribution soon revealed itself, and the situation became critical in 1943 when the casualty figures rose sharply and there was a desperate need for physically fit replacements. The Ground Force began to complain more and more vigorously about the type of men they were being furnished for training. It then became obvious that certain means had to be devised for the distribution of manpower which would consider a person's physical capacities, as had already been done with respect to occupational skills and intelligence level. The Surgeon General of the Army was requested, therefore, in the fall of 1943 to formulate a plan for a physical classification to be used in the assignment and distribution of personnel *(4, 5)*.

---

(3) Voluntary enlistment into the Armed Forces of men between 18 and 38 years of age was stopped in December 1942 (WD Circular No. 397, 1942). Beginning with 1 February 1943, both the Army and the Navy had to procure all enlisted personnel within these ages through the operation of the Selective Service System (SPX 324.71 (1-22-43) PR-I, 22 Jan 43). Men 17 years old, however, continued to be enlisted by the Navy. Also, the Army began to enlist 17 year olds into the Enlisted Reserve Corps and Air Corps Enlisted Reserve. These reservists were not eligible for active duty in the Army until they reached 18 years of age. Thus, this change in policy was only partially effective in its attempt to stop voluntary enlistment.

(4) Physical Standard Research Project, prepared for the Adjutant General's Office, Personnel Research and Procedures Branch, Manpower Analysis Section, 4 Aug 1949.

(5) History of the Physical Profile Serial System, intra-office memorandum, Physical Standards Division, Surgeon General's Office, 10 June 1945.

It was clear from the nature of the request that a system had to be devised which would provide a concise descriptive evaluation of a person's physical capacities from a functional, rather than a diagnostic, point of view and that this evaluation had to be couched in terms readily understandable by nonmedical men in charge of assigning recruits. After many proposals for such a plan, the PULHEMS system *(6-10)*, which was developed by the Canadian Army for the same purpose, was adopted in essence by the United States Army.

PULHES SYSTEM

The United States profile system is known as PULHES. As defined by the Army Regulations on physical standards and physical profiling, the separate factors comprising PULHES express the following:

P—Physical capacity or stamina: Organic defects, age, build, strength, stamina, height, weight, agility, energy, muscular co-ordination, and similar factors.

U—Upper extremities: Functional use of hands, arms, shoulder girdle, and spine (cervical, thoracic, and lumbar) to include strength, range of motion, and general efficiency.

L—Lower extremities: Functional use, strength, range of motion, and general efficiency of feet, legs, pelvic girdle, and lower back (sacral spine).

H—Hearing (including ear defects). The auditory acuity is to be considered as well as organic defects.

E—Eyes: Visual acuity, as well as organic ocular defects.

S—Neuropsychiatric: Emotional stability, personality, as well as psychiatric history and findings.

Except for the P factor, the profile factors relate either to the functional capacity of specific organs, or to a specific evaluation, as the S factor. The P factor, however, is both specific and general. It is specific in that it refers to the functional capacity of all other parts of the body, not specified under the other factors, and it is general in that it is affected by the extent to which de-

(6) Mooney, C. M.: "Pulhems." Canad. Army J. No. 2, pp. 13-19, Apr. 1947.

(7) Meakins, J. C.: "Pulhems" system of medical grading. Canad. M. A. J. 49: 349-354, Nov. 1943.

(8) Fletcher, R. T.: PULHEEMS, a new system of medical classification. Brit. M. J. 1: 83-88, Jan. 15, 1949.

(9) Campbell, A. E.: Assessment of physical fitness for service in British Army. U. S. Armed Forces M. J. 1: 1527-1535, Dec. 1950.

(10) War Office (United Kingdom): Report of the Health of the Army, 1946-1948. W. O. Code No. 6765, Jan. 12, 1952.

fects of any organ, including disorders of a psychiatric nature are affecting a person's general functional ability.

In evaluating a person's profile, each of the factors is graded on a numerical regressive scale from 1 to 4, according to the man's functional capacity in the particular factor. Generally, grade 1 represents functional efficiency above the average, with no physical defects or minimal physical defects; grade 2 represents average functional efficiency, with mild nonprogressive physical defects; grade 3 represents functional efficiency below the average, with moderate physical defects (borderline); and grade 4 represents functional capacity below the existing minimum requirements for military service. The grade profile factors are collectively referred to as "profile serial."

For a general evaluation and allocation of manpower, the profile serials are grouped in 4 physical categories (A, B, C, and E) based on the grades of the various profile factors. At present, the physical categories are defined as follows *(11)*:

A—A profile in which lowest rating is 1 (e. g., 111111).
B—A profile in which lowest rating is 2 (e. g., 112111).
C—A profile in which lowest rating is 3 (e. g., 211113).
E—A profile in which lowest rating is 4 (e. g., 412112).

PULHES VS. PULHEMS

Though basically the same as the Canadian system (PULHEMS), the United States profile system (PULHES) represents a fundamental departure from that system. The primary difference between these two systems is the omission in "PULHES" of the M factor, denoting "intellectual (mental) status" and derived from the "M" tests administered to all men processed for military service in the Canadian Army for the measurement of their "general mental level." These tests have a dual function in the Canadian system: they are designed to gage the recruit's "ability, under Army conditions, to learn to perform successfully general duties under supervision" and screen out those who do not possess such ability; and to serve, together with the other profile factors, as a basis for allocating men, who pass the test, to the proper arm or corps within the Army.

The tests consist of a series of problems. The raw scores obtained on these tests are usually expressed in terms of 6 groups presenting a gradation of mental ability: from "superior ability" (group I) to "very little likelihood of success in normal basic training" (group VI). From these mental groupings the following profile grades of the "M" profile factor are derived:

(11) Physical Standards and Physical Profiling for Enlistment and Induction, AR 40-115 (Aug. 1948).

1. Intelligence sufficient for full combat duty and training, including appropriate tradesman or specialist training.

2. Intelligence sufficient for nontradesman or nonspecialist combat duties or for trades requiring experience rather than ability.

3. No grade 3 is assigned to the "M" factor.

4. Specific defect or defects, e. g., slight mental retardation. Useful only in works companies, pioneer companies, et cetera.

5. Unsuitable for service anywhere in any capacity (*6, 12*).

The initial mental tests employed by the U. S. Army, currently known as the Armed Forces Qualification Tests (AFQT), correspond to the "M" tests in general structure and initial function. Structurally, the AFQT contain in equal proportion: (1) questions on the meaning of words, (2) arithmetic problems, and (3) problems dealing with forms and patterns. These tests are given to each examinee at the time of the initial examination. The AFQT were first used in 1950 (*13*).

On the basis of their scores on the AFQT, the present-day examinees are divided into 5 groups representing, as on the AGCT, a regressive range in mental ability from very rapid learners (group I) to very slow learners (group V) (*14-16*). The groups expressed in term of scores on the AFQT were (until December 1951) as follows:

Group	*Score*
I	93-100
II	65-92
III	31-64
IV	13-30
V	12 and below

These values for groups IV and V prevailed during the time of the findings here presented. Since December 1951 the score range

(*12*) Physical Standards and Instructions for the Medical Examination of Serving Soldiers and Recruits for the Canadian Army, Active and Reserve, 2d edition, 1943 (Section III, Functional Interpretation of Medical Grades—Men; Section VIII, Personnel Section).

(*13*) During the 1948 induction processing, the Army General Classification Test (AGCT) was used for the same purpose. It was also used during World War II, except that it was accomplished at the reception centers and not at the time of the first medical examination as has been the practice since 1948. AFQT and AGCT are essentially the same.

(*14*) Enlisted Men: Initial Classification, AR 615-25 (31 July 1942).

(*15*) Personnel Classification, TM 12-425, War Department (17 June 1944).

(*16*) Personnel Classification Tests, TM 12-260, War Department (Apr. 1946).

242918 O - 53 - 8

for group IV has been 10 to 30; and that for group V, 9 and below *(17)*.

Functionally, the AFQT have been devised to measure the recruit's "ability to absorb military training within reasonable limits of time;" to eliminate those who do not have such ability (group V); and to provide a uniform measure of the "general usefulness for the service" of those who qualified on the test (groups I-IV). At present, the latter groupings serve as the basis for an equitable qualitative distribution of manpower among the various components of the Armed Forces (Army, Navy, Marine Corps, and Air Force).

With this initial mental assessment, the function of the AFQT ends. Each man inducted into the Army, however, is given at the reception center an additional series of tests known as the Army Classification Battery. These tests have been developed to measure "specific" kinds of aptitude, knowledge, or skill and thus determine the recruit's "specific" usefulness to the service in particular kinds of job or training assignment. In addition to these tests, the recruit's physical profile, accomplished at the induction station, is verified at that time. His military occupational specialty (MOS) and assignment are determined on the basis of the latter tests and the verified physical profile *(18-20)*.

Unlike the "M" tests, however, the results of the AFQT and those of the other mental tests do not constitute a part of the U. S. profiling system. Only the mentally deficient, who have been psychiatrically so determined, are graded under PULHES. As provided by the existing regulations on the processing of examinees, determination of mental deficiency is part of the psychiatric examination. It is accomplished independently of the AFQT score, though these scores may bear invaluable corroborative evidence of the presence or absence of mental deficiency. This examination aims essentially at innate mental deficiency, or at "acquired" mental deficiency which is not due to sheer lack of educational opportunities or unfavorable environmental conditions. The AFQT are primarily a screening and general evaluation device and they do not attempt to differentiate among the underlying causes of low mental ability. Illiteracy per se consequently is not considered mental deficiency in the psychiatric sense; nor is, in general, low educational attainment per se judged as such. Mental deficiency, psychiatrically defined, is recorded in the PULHES system under the S factor.

---

(17) General Review of the Induction Experience Under the Selective Service Extension Act of 1950. Health of the Army, vol. 6, No. 11, pp. 1-13, Sept. 1951.

(18) Enlisted Men, Army Classification Battery, SR 615-25-27 (Feb. 1951).

(19) Enlisted Men: Classification Procedures, SR 615-25-25 (Feb. 1951).

(20) Enlisted Personnel: Procedures for Use of Rate Tables in Distribution of Enlisted Personnel, SR 615-25-28 (Feb. 1951).

Under the U. S. profiling system, each examinee is thus assigned at the time of initial examination a double classification to reflect separately his physical category, based on the medical (physical and psychiatric) examination, and his mental grouping, based on his AFQT score, e. g., A-III (physical category A and mental group III). Similar recording procedures are followed at the reception centers. The profiling is confined to medical findings. The mental scores are reported separately, including the recruit's aptitude area, derived on the basis of the tests given at the reception centers. All these findings are recorded on the "Soldier's Qualification Card" (WD AGO Form 20) *(21-23)*.

The separation of these two measures of appraisal—one relating to physical stamina and the other referring to intelligence and skill—is fully justified from a theoretical as well as from a practical point of view. Theoretically, they represent two distinct levels of evaluation that should be kept apart. From a practical point of view, this double classification is important in the assignment of men to the proper job within the Army because different jobs represent distinct balances between physical and mental requirements. Furthermore, the physical standards have practically reached a stabilized level and no basic changes in these standards may be expected, but the intelligence requirements (as determined by AFQT and equivalent tests) are elastic to a great degree. Because of this elasticity in the intelligence requirements, it is essential to be able to identify men who are physically qualified (physical categories B and C) but are intellectually marginal. This can be expediently accomplished on the basis of such a classification. In fact, this classification was used when the AFQT requirements were lowered in December 1951 and all those who were found medically qualified but who failed the test prior to that time were re-examined *(24)*.

ACCOMPLISHMENT OF PROFILING

The United States profiling system was inaugurated in 1944 *(25)* and was initially carried out at the reception centers. At that time profiling had as its purpose the qualitative apportionment of the men among the Ground Force, Army Service Forces, and Air Force, after the critically needed specialists had been assigned.

---

(21) Enlisted Personnel: Joint Examining and Induction Station Procedures, SR 615-180-1 (Nov. 1951).

(22) Enlisted Personnel: Armed Forces Examining Stations, SR 615-100-1 (Oct. 1951).

(23) Personnel: Army Reception Center: Personnel Processing Procedures, SR 600-510-5 (Aug. 1950).

(24) Results of Re-examinations of Selective Service Registrants. Health of the Army, vol. 7, No. 7, July 1952.

(25) Adjutant General's Letter SPOX 220.01 (3 Mar 1944), OC-HWDGAP, and War Department Memorandum: Physical Profile Plan, W40-44, (May 1944) and Supplement to MR 1-9: Physical Profile Serial, (May 1944).

A special study on profiles was carried out by the Surgeon General's Office at the training centers during the period from 16 December 1944 through April 1945. It was undertaken primarily in order to determine the reliability of the physical profiles accomplished at the reception centers and to obtain information on the physical status of men who had completed basic training. No attempt has been made here to draw on that material for comparison with the present findings because the physical profile categories were derived then in a different way from that now used. Furthermore, the physical standards have been changed since then, especially with respect to psychiatric requirements.

Beginning with the enactment of the 1948 Selective Service Act, the profiling of each examinee and the assignment of a physical category is being accomplished at the time of the initial medical examination. Since the end of 1951 the accomplishment of the medical and mental examination was transferred from the induction stations to the Armed Forces examining stations which are charged with performing these examinations for all Armed Forces of both registrants and enlistees who are within the chargeable group, namely all who are not exempt from induction under the existing Selective Service Act *(26)*. A special box is designated for this purpose on the examinee's "Report of Medical Examination" (Standard Form 88) as follows:

PHYSICAL PROFILE					
P	U	L	H	E	S
PHYSICAL CATEGORY					
A		B	C		E

Under "Physical Profile," the examinee's respective grade for each factor is recorded; under "Physical Category," the proper box is checked, as determined by the profile grades. In the case of Selective Service registrants, the profiles are likewise reported on the examinee's "Record of Induction" (DD Form 47), accomplished in addition to Standard Form 88. This form also carries the examinee's score on the mental test and his mental group. This profiling is applied to both disqualified and qualified registrants.

(26) SR 615-100-1.

FACTORS AFFECTING PROFILES

Prior to discussing the findings with respect to the profiles of the present-day inductees, the primary changes in the current medical standards and the induction policies affecting these findings will be briefly considered.

The medical standards which governed the acceptability of men for military service during the period, to which the present findings relate, are set forth in Army Regulations *(27)*. The only deviation from these standards were the temporary, relatively high, dental requirements which were effective during the first 2½ months of this period. The temporary stringency in the dental requirements was dictated by an early lack of sufficient dental personnel in the Army to handle the dental load that would have resulted from low dental standards. The present dental requirements are the same as those of World War II, after 1942, which state that any well-nourished person of good musculature is acceptable, if free from gross dental infections, and having a minimum of an edentulous upper jaw and/or edentulous lower jaw, corrected or correctible by full denture or dentures. The present physical standards are virtually the same as those of World War II (after 1942), except for the psychiatric requirements which have been liberalized since World War II. The change in policy with respect to psychiatric requirements stems from World War II experience which seemed to suggest that the psychiatric standards applied then for eliminating men with minor evidences of instability might have been overcautious and thus possibly have brought about a loss of potential military manpower *(28)*. Under the present standards, psychoneurosis of any degree is acceptable if it has not incapacitated the person in civil life. Persons with a history of transient psychotic reactions are considered acceptable if they have otherwise demonstrated stability. Such persons were not acceptable during World War II. There were also some minor changes towards lower physical standards with regard to perforated eardrums, paroxysmal convulsive disorders (if controlled by medication), moderate deformities of the extremities, et cetera, which were considered disqualifying defects during World War II.

Of the changes in the general induction policies affecting the profiling of inductees, the most important is the change with respect to induction of persons formerly classified as "limited service." The term "limited service" is no longer in use. In essence, however, men now classified as physical category C are of the "limited service" type. There was no constant policy during

(27) Physical Standards and Physical Profiling for Enlistment and Induction, AR 40-115 (20 Aug 1948).

(28) Brill, N. Q., and Beebe, G. W.: Psychoneurosis; military applications of follow-up study. U. S. Armed Forces M. J. 3: 15-33, Feb. 1952.

World War II regarding the induction of limited Service personnel. Such men were (1) not inducted; (2) inducted on a quota basis (usually 5 percent) in relation to the other qualified registrants; or (3) their induction was restricted by certain additional educational and occupational standards not required of other registrants. At present there are no numerical or other restrictions with respect to the induction of persons in physical category C *(17)*.

TABLE 1. *Percent distribution of inductees by physical category and mental group (August 1950 through June 1951)**

Physical category	*Mental group*					
	I	II	III	IV	V**	Total
A	4.2	12.1	17.9	28.1	13.3	75.6
B	1.5	3.3	4.2	5.4	1.9	16.3
C	0.8	1.8	2.1	2.5	0.9	8.1
Total	6.5	17.2	24.2	36.0	16.1	100.0

*The data include continental United States and territories.
**Administratively declared acceptable though failed AFQT.

PHYSICOMENTAL DISTRIBUTION OF THE INDUCTEES

Though the object of this analysis is to present data on the physical evaluation of the inductees, it seemed desirable for general orientation to present the mental grouping of the inductees along with their distribution by physical category. This distribution of the registrants inducted during fiscal year 1951 (August 1950 through June 1951) is given in table 1 *(29)*. The data presented in the table are based on "Summary of Registrant Examinations for Induction" (DA AGO Form 316). This report is prepared each month by each induction station and submitted to the Office of the Surgeon General. The information for this summary report is obtained by the induction stations from the DD Form 47 and Standard Form 88.

DISTRIBUTION OF PHYSICAL CATEGORIES B AND C

In a general evaluation of physical fitness, a distribution by physical categories, as shown in table 1, may be sufficient, but more detailed information is needed when general plans for training or for job assignment are considered. From the point of view of training or job assignment, there is a difference between

(29) The induction of registrants under the Selective Service Extension Act of 1950 began in August 1950.

TABLE 2. *Distribution of inductees in physical category B, by PULHES: Total 19,388*

*(August 1950 through June 1951)**

Combination of factors	Number of persons having rating 2 under each factor						Percent of persons having rating 2 under each combination of factors
	P	U	L	H	E	S	
P	2,927	-	-	-	-	-	15.1
U	-	552	-	-	-	-	2.8
L	-	-	4,727	-	-	-	24.4
H	-	-	-	741	-	-	3.8
E	-	-	-	-	6,780	-	35.0
S	-	-	-	-	-	1,037	5.3
PU	167	167	-	-	-	-	.9
PL	662	-	662	-	-	-	3.4
PH	59	-	-	59	-	-	.3
PE	390	-	-	-	390	-	2.0
PS	198	-	-	-	-	198	1.0
UL	-	58	58	-	-	-	.3
UH	-	10	-	10	-	-	.1
UE	-	42	-	-	42	-	.2
US	-	9	-	-	-	9	••
LH	-	-	62	62	-	-	.3
LE	-	-	418	-	418	-	2.2
LS	-	-	125	-	-	125	.6
HE	-	-	-	60	60	-	.3
HS	-	-	-	12	-	12	.1
ES	-	-	-	-	129	129	.7
PUL	19	19	19	-	-	-	.1
PUH	4	4	-	4	-	-	••
PUE	11	11	-	-	11	-	.1
PUS	4	4	-	-	-	4	••
PLH	14	-	14	14	-	-	.1
PLE	67	-	67	-	67	-	.3
PLS	33	-	33	-	-	33	.2
PHE	1	-	-	1	1	-	••
PHS	4	-	-	4	-	4	••
PES	21	-	-	-	21	21	.1
ULH	-	1	1	1	-	-	••
ULE	-	2	2	-	2	-	••

TABLE 2. *Distribution of inductees in physical category B, by PULHES: Total 19,388*—Continued

*(August 1950 through June 1951)**

Combination of factors	Number of persons having rating 2 under each factor						Percent of persons having rating 2 under each combination of factors
	P	U	L	H	E	S	
ULS	-	3	3	-	-	3	**
LHE	-	-	6	6	6	-	**
LES	-	-	20	-	20	20	.1
PLHE	1	-	1	1	1	-	**
PLHS	2	-	2	2	-	2	**
PLES	5	-	5	-	5	5	**
PHES	2	-	-	2	2	2	**
PULE	1	1	1	-	1	-	**
ULES	-	1	1	-	1	1	**
PLHES	1	-	1	1	1	1	**
Number	4,593	884	6,228	980	7,958	1,606	
Percent	23.7	4.6	32.1	5.1	41.0	8.3	100.0

*Sample tabulation of DD Form 47 and Standard Form 88.
**Less than .05 percent.

persons classified, say, as B, because of "E," or "L," or "S" factors, or because of all profile factors combined. It is important to know the specific limiting profile factors. In order to obtain such information, a sample tabulation was made of inductees in the physical categories B and C in terms of the profile factors. The results for fiscal year 1951 are shown in tables 2 and 3.

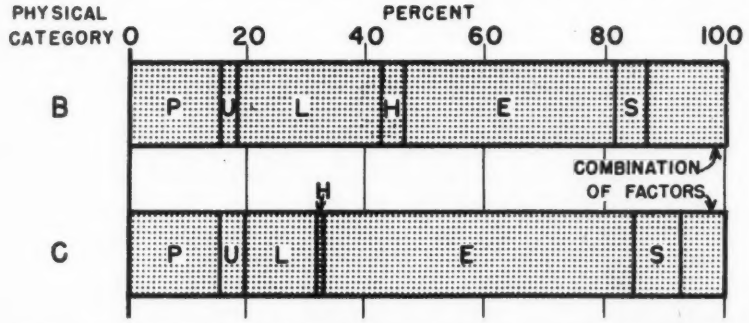


Figure 1. Distribution of inductees in physical categories B and C by PULHES.

TABLE 3. *Distribution of inductees in physical category C, by PULHES: Total 9,761*

*(August 1950 through June 1951)**

Combination of factors	Number of persons having rating 3 under each factor						Percent of persons having rating 3 under each combination of factors
	P	U	L	H	E	S	
P	1,470	-	-	-	-	-	15.2
U	-	434	-	-	-	-	4.4
L	-	-	1,175	-	-	-	12.0
H	-	-	-	87	-	-	.9
E	-	-	-	-	5,089	-	52.2
S	-	-	-	-	-	768	7.9
PU	102	102	-	-	-	-	1.0
PL	166	-	166	-	-	-	1.7
PH	4	-	-	4	-	-	**
PE	178	-	-	-	178	-	1.8
PS	91	-	-	-	-	91	.9
UL	-	10	10	-	-	-	.1
UH	-	1	-	1	-	-	**
UE	-	33	-	-	33	-	.3
US	-	1	-	-	-	1	**
LH	-	-	1	1	-	-	**
LE	-	-	56	-	56	-	.6
LS	-	-	12	-	-	12	.1
HE	-	-	-	4	4	-	**
HS	-	-	-	2	-	2	**
ES	-	-	-	-	47	47	.5
PUL	5	5	5	-	-	-	.1
PUE	2	2	-	-	2	-	**
PLE	11	-	11	-	11	-	.1
PLS	1	-	1	-	-	1	**
PES	6	-	-	-	6	6	.1
ULE	-	1	1	-	1	-	**
LES	-	-	3	-	3	3	**
PULE	1	1	1	-	1	-	**
Number	2,037	590	1,442	99	5,431	931	
Percent	20.9	6.0	14.8	1.0	55.6	9.5	100.0

*Sample tabulation of DD Form 47 and Standard Form 88. **Less than .05 percent.

Physical category B. The highest proportion of the inductees in category B were so graded because of the E factor. Next in order of frequency were the L, P, S, H, and U factors in that order. Of the total number of inductees in physical category B, 86.4 percent had grade 2 in one profile factor only.

TABLE 4. *Percent distribution of physical categories B and C, by PULHES and race*

*(August 1950 through June 1951)**

Profile factors	Percent distribution					
	Physical category B			Physical category C		
	Total	White	Negro	Total	White	Negro
P	15.1	15.6	11.2	15.2	14.9	17.9
U	2.8	3.0	2.0	4.4	4.4	5.3
L	24.4	21.4	48.1	12.0	11.6	17.8
H	3.8	4.1	1.8	0.9	0.9	0.3
E	35.0	36.7	21.9	52.2	52.7	45.6
S	5.3	5.5	4.3	7.9	7.9	8.0
Combination of above factors	13.6	13.7	10.7	7.4	7.6	5.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Sample tabulation of DD Form 47 and Standard Form 88.

Physical category C. The frequencies under the separate profile factors in category C, arranged by order of magnitude, were E, P, L, S, U, and H. Of the total number of inductees in this category, 92.6 percent had a grade 3 in one profile factor only (fig. 1). There was a racial differential in the distributions of the physical categories B and C by PULHES (table 4). Among the white inductees, the most limiting profile factor was E and among the Negro inductees, it was L.

GENERAL PHYSICAL ASSESSMENT OF THE INDUCTEES

By combining the findings presented above on the distribution of the inductees by physical category (table 1) with those presented with respect to the distribution of the inductees in physical categories B and C by PULHES (tables 2 and 3), the general physical assessment of the inductees shown in table 5 is derived.

TABLE 5. *Functional limitations in 1,000 inductees as expressed by PULHES (August 1950 through June 1951)*

Profile factor	Physical categories		Total
	B	C	
P	39	17	56
U	7	5	12
L	51	2	53
H	8	1	9
E	68	44	112
S	14	8	22

UNDERLYING DIAGNOSES

The principal diagnoses responsible for the functional limitations as expressed by the various profile factors of the physical categories B and C, arranged in descending order of frequency, were:

Category B:

P—Overweight, underweight, insufficient serviceable teeth, and symptoms referable to limb and back;

U—Curvature of the spine (congenital or acquired), amputated fingers, and limitation of motion of hand and elbow;

L—Pes planus (primarily first and second degrees);

H—Defective hearing, defects of the tympanic membrane, and unilateral deafness;

E—Defective vision;

S—Psychoneurotic disorders (primarily anxiety reaction) and emotional instability.

Category C:

P—Underweight, inguinal hernia, overweight, insufficient serviceable teeth, and symptoms referable to limb and back;

U—Curvature of the spine (congenital or acquired); amputated fingers, and limitation of motion of elbow;

L—Pes planus (primarily third degree), clubfoot, and internal derangements of knee;

H—Defects of the tympanic membrane;

E—Defective vision, unilateral blindness, and amblyopia;

S—Psychoneurotic disorders (primarily anxiety reaction) and emotional instability.

The underlying diagnoses were about the same for both B and C physical categories. The difference was apparently in the degree, or severity, of the impairment.

TABLE 6. *Percent distribution of inductees of specified age by physical categories*

*(August 1950 through June 1951)**

Physical category	Age groups (years)		
	19-20	21-22	23-25
A	78.6	75.3	69.7
B	14.1	16.6	19.0
C	7.3	8.1	11.3
	100.0	100.0	100.0

*Sample tabulation of DD Form 47 and Standard Form 88.

VARIATION BY AGE

To complete the background on the physical assessment of inductees, an inquiry was made as to the possible effect of age on the distribution of inductees by physical category. The results of this inquiry are shown in table 6. Even within this narrow age range, marked differences may be noticed in the distributions by physical categories. There was a marked decrease in the proportion of physical category A (from 79 percent to 70 percent), when the youngest age group (19 and 20 years) is compared with the oldest age group (23 to 25 years), and corresponding increases in the other physical categories, especially in category C (from 7 to 11 percent). The average age of the inductees of this period was 22 years. More pronounced differences in the distribution by physical categories may be anticipated with more advanced age groups. Shifts in the relative distribution by PULHES also may be expected with advanced ages.

THE MANAGEMENT NURSE

MARY I. HOGAN, *Major, ANC, USA (1)*

THE management office is a relatively new unit in the Army hospital organizational pattern. This office was authorized in 1950 on the authority of Surgeon General's Office Circular 119 and SR 40-610-5. This action was in accord with the movement in all government agencies toward efficiency and economy of operation. The management office was created so that the individual installations might develop and carry on their own programs for management improvement.

The mission of the management office is to study hospital operational efficiency, organization, administrative procedures and methods, and to present recommendations for improvements or changes in policy. This office prepares budgetary estimates and controls appropriated funds, studies manpower requirements and makes recommendations for allocation of personnel, and provides counseling service in hospital management. It operates as a fact-finding, planning, and advisory agency, but has no authority to issue orders or directives in its own name.

When the concept of the management improvement program for Army hospitals was first considered, far-seeing leaders in the Army Medical Service and the Army Nurse Corps saw the need and advantage of including a nurse in the management office personnel. Although the nursing service is one of the largest units in the hospital organization, it depends on the services of every unit in the hospital to fulfill its purpose. By the same token, problems or changes in any one of the other units affect the nursing service in some way, either directly or indirectly. A nurse understands these interrelationships better than those who are not directly concerned with patient care and she is better able to evaluate the implications of the problem for nursing service than is any other member of the management staff.

In all large installations and in most of the smaller ones, where active management improvement programs are in operation, a nurse is a full-time member of the management staff. This has 2 advantages. *First,* the nurse is freed from the distractions which so often result if she is given additional supervisory or teaching responsibilities and she would, at the same time, be accountable to the chief nurse and the management officer. Experience has

(1) Walter Reed Army Hospital, Washington, D. C.

shown that any kind of study or research requires time to plan, experiment, and evaluate. The nurse who is busy with administrative or ward activities has little or no time left to do any of these things. The *second* advantage is that as a co-worker on problems of supplies, procedures, or construction, the nurse can orient her associates to the nurse's viewpoint.

Many of our problems arise from trying to meet today's nursing needs with yesterday's methods and equipment, and in some situations, with the day-before-yesterday's hospital construction. The nurse's primary concern as a member of the management staff is to study the problems of the nursing service. For the most part, her time is expended on developing her own projects, problems she studies independently of the other members of the management staff. She might, for example, revise the procedure manual, develop an assignment sheet, revise the procedures for the care of the dishes on the communicable disease ward, or test and evaluate a new piece of equipment. Sometimes the nurse is engaged in projects in a consultative capacity. An example of this type of project might be on the study of hospital housekeeping which entails the transfer of certain duties to the custodial group. She would appraise the ward situation and make recommendations as to which duties should be retained by the nursing personnel because of the patient's welfare. She might participate in some large research project which engages the services of the entire management office. An example of such a project might be an experimental study to develop a technic for the analysis of ward duties as a means for establishing staffing standards.

These examples should leave no doubt that a nurse is needed in the management office. There is no danger that her professional ability is being wasted in a so-called non-nursing assignment. Problems requiring study are generally referred to the management office, through channels, by the chief nurse. This is in accordance with good procedure and is essential if the management nurse is to be of greatest value to the nursing service. Close liaison between the management office and the nursing service is the answer to a successful management program as far as the nursing service is concerned. The term "nursing problems" should not be construed to mean such matters as where to get new curtains for the day-room, how to get a cabinet built, or why the linen counts are short. If the management nurse has some influence or can assist the ward nurse in any way, she should do so, but for her to engage exclusively in such matters, would be to place her in the role of a trouble-shooter. If only such problems were given to her, a "Let George do it" situation would soon develop and she would be expected to play the unenviable role of George.

This following study shows how the management office and the management nurse assisted the nursing service. A standard operating procedure was desired for one of the neurosurgical wards. The best possible nursing care is only a concept until it is translated into appropriate activities. The problem involved determining what is good nursing care on a paraplegic ward, and developing a ward administrative plan which would provide such care. The management office personnel studied the ward situation for 2 weeks. Before any concrete plans could be laid it was necessary to answer the following questions:

1. Are the personnel qualified by training to do the tasks assigned to them?

2. Is a sufficient number of hours of nursing care, both professional and nonprofessional provided?

3. How much and what kind of supervision is available to the nursing personnel?

4. Is there a training program for workers?

5. Are scientific principles followed in giving treatments?

6. Are doctors' orders carried out accurately and promptly?

7. What is the accident record of the ward?

8. Are the physical facilities adequately arranged and managed?

9. Is there an organizational pattern which clearly shows the lines of authority and responsibility?

10. Are specific duties assigned to ward personnel?

11. Are the patients' physical, emotional and spiritual needs being met?

12. Are economy of time, energy, and supplies considered?

13. Is the workflow smooth?

Another matter of high priority was to determine the various components of the nursing care requirements of neurosurgical patients. The management nurse evaluated all activities relating to (1) control of environment, (2) mental adjustments, (3) nutrition, (4) elimination, (5) rest, sleep, and personal hygiene, (6) position, posture, and exercise, (7) record of patient's responses to treatments and medications, and (8) conditioning for recovery and health. She investigated each activity with regard to the safety and comfort of the patient; and present and long-range

therapeutic effect. The patient load and workload were studied. Information was collected on the length of time spent by the personnel in performance of such nursing-care activities as giving baths, taking temperatures, giving irrigations, turning the Stryker frames, et cetera. This information revealed that the existing staff needed to be augmented by additional workers if all of the necessary measures were to be accomplished.

Ward facilities and the workflow were jointly studied by the management personnel. From this came many changes in the ward which made for better working arrangements. The management nurse consulted with the engineer for special pegs and rods for irrigators. By the time that the study was terminated, a pattern for nursing care and a ward operating plan had been developed which made the best possible nursing care an actuality. The program included a plan for the head nurse in the management of her ward and supervision of the personnel. The duties of the ward nurses were defined and responsibilities were clearly established; work assignments were developed which coincided with the training and qualifications of the workers; schedules for treatments and the turning of Stryker frames were worked out; and lines of supervision and channels of communication were defined. This study established a method for developing a ward administrative plan which could be used as a pattern for developing a standard operating procedure for any type of ward.

It should be apparent that the management nurse is primarily a research investigator. She must be able to use the technical skills and tools of research. She needs to know the differences between the mean, median, and mode and why one would be used in preference to another in evaluating certain data. She should be able to look at figures objectively because they will either confirm or disprove her assumptions. She needs to be able to (1) define a problem so that a workable solution can be devised, (2) prepare a questionnaire, and (3) organize and tabulate figures. She is not expected to be an expert statistician but she should know enough about is so that she can decide when she needs the assistance of a consultant in that field.

Sound analysis of findings requires observation and judgment. Many studies may be concerned chiefly with qualitative aspects because research is not necessarily statistical or quantitative. With these tools the management nurse can approach her job with security. She will grow on the job and will be able to operate independently or to participate effectively in group undertakings.

HYPERTROPHY OF THE HEART OF UNKNOWN CAUSE[1]

JOHN B. SELBY, *Captain, MC, USA*

LeGRAND H. THOMAS, *Captain, MC, USA*

OCCASIONAL cases of extreme cardiac hypertrophy are seen without evidence of physiologic or anatomic defects to explain them. These have continued to prove puzzling, and one of the heaviest hearts of modern times, 1,475 grams, was not adequately accounted for as to pathogenesis (2). A large number of these cases have occurred in young adults. Perhaps some of these could be explained by glycogen storage (von Gierke's) disease, myocarditis of unknown cause, coronary anomalies, and excessively rapid rates in paroxysmal tachycardia, but careful study along many of these lines has not been productive. Norris and Pote (3), for example, could find no common factor or evidence of any cause for their 4 cases of congestive failure, hypertrophy, and dilatation of the heart. Their patients were all men between the ages of 21 and 30 years who had been in the armed services. One of these had known of this cardiac hypertrophy for 20 months before death, but the others had signs or symptoms referable to the cardiovascular system for shorter periods. Roentgenograms of the chest were normal in these patients and their past history was under closer scrutiny than that of the average adult.

As was to be expected in young servicemen, their health had been excellent, and it seems wholly unlikely that they could have so-called congenital idiopathic hypertrophy of the heart. The heart weights in this series were 890, 560, 550, and 540 grams. Levy and Rousselot (4) reported unexplained cardiac hypertrophy in 3 men aged 18, 21, and 29 years. The duration of their illness from the onset of incapacitating symptoms to death was less than a year in each. How long hypertrophy was present before the onset of discomfort was not known, but all of these cases indicate

(1) Valley Forge Army Hospital, Phoenixville, Pa.

(2) Golden, J. S., and Brams, W. A.: Extreme cardiac enlargement. Am. Heart J. 13: 207-216, Feb. 1937.

(3) Norris, R. F., and Pote, H. H.: Hypertrophy of heart of unknown etiology in young adults; report of 4 cases with autopsies. Am. Heart J. 32: 599-611, Nov. 1946.

(4) Levy, R. L., and Rousselot, L. M.: Cardiac hypertrophy of unknown etiology in young adults; clinical and pathological study of 3 cases. Am. Heart J. 9: 178-195, Dec. 1933.

242918 O - 53 - 9

a progressive process, and it seems highly unlikely that a congenital defect could be responsible. They cite Whittle's (5) case of a previously healthy 20-year-old student who died suddenly while riding a bicycle. His heart weighed 840 grams and his thymus 30 grams. His aorta was delicate and of small caliber, measuring 16 mm. at the beginning of the descending portion. The average normal aorta at this level measures 23 mm. Although the hypoplastic aorta was not considered to be a primary causative factor, it is interesting because of the small but not definitely abnormal aorta found in the case to be presented here.

CASE REPORT

A 21-year-old man was called to military duty on 12 August 1950 for a 2-week training period at Fort Dix, N. J. On 14 August he developed nausea and on 15 August he noted pains in the upper abdomen, radiating through the lower chest region. These pains were not severe, but were associated with profuse sweating, weakness, and anorexia. On 19 August, while at home on pass, he developed dyspnea. He returned to camp and reported on sick call where he was given sodium bicarbonate tablets on 21 August. A cough developed and the dyspnea became worse. On 26 August he had finished his training period and was driven to Newark Air Force Base to leave for his home. He felt so ill and was so dyspneic that he was seen by a medical officer, who ordered that he be sent back to Fort Dix and hospitalized as an emergency.

On admission to the U. S. Army Hospital, Fort Dix, N. J., he was acutely ill, orthopneic, and perspiring profusely, but there was no cyanosis. There was slight venous distention in his neck and a few crepitant rales were noted at the bases of his lungs. His left cardiac border extended to the anterior axillary line, and there was a tick-tock rhythm. No murmurs were heard. His liver was palpable and slightly tender. His blood pressure was 100/60 in the right arm, 102/80 in the left arm, 100/80 in the right leg, and 130/90 in the left leg. He denied any previous knowledge of heart disease, rheumatic disease, growing pains, frequent nosebleeds, or serious sore throats, but stated that he had a morning cough of 2 months' duration which became productive of a small amount of yellow-green sputum about a week before the onset of his present illness. His leukocyte count was 17,000. His antistreptolysin titer on 7 September was between 1,200 and 1,400 units per cc. On 27 November it was between 200 and 250 units per cc. His antifibrinolysin reaction was 3 plus on 7 September. Several sedimentation rates were determined and all were normal. Serum proteins were 5.7 grams per 100 cc. on 21 September with a normal A/G ratio. Repeated throat cultures showed predomi-

(5) Whittle, C. H.: "Idiopathic" hypertrophy of heart in young man. Lancet 1: 1354-1355, June 29, 1929.

nantly neisseria and some *Escherichia coli*. A blood culture was negative. A roentgenogram of the chest on 26 August showed gross enlargement of the heart shadow in all dimensions, the shape being such as to suggest a pericardial effusion. ECG's showed the T waves to be flat in lead aV_L and inverted and diphasic in leads I, II, III, aV_F, V_5, and V_6.

The patient was given meralluride injection and penicillin on admission. He was digitalized on 2 September. He complained of diplopia, and diphtheritic myocarditis was considered but this was not substantiated by throat cultures. On 2 September his peripheral pulse became almost imperceptible and he had signs of cardiac tamponade. An attempted pericardial tap was unsuccessful. On 2 December he developed a cough and a purulent postnasal discharge. Treatment with penicillin, which had been discontinued, was resumed and aureomycin was given. His rectal temperature had risen to 104° F. by 3 December, but in the next day and a half his temperature dropped to normal and remained so.

He was transferred to this hospital on 4 January 1951. He was not acutely ill on admission. A roentgenogram of his chest showed his lungs to be clear but his cardiothoracic ratio was 17:29. P_2 was accentuated. There was a soft, grade I systolic murmur at his apex, a gallop rhythm, and a pulsus alternans. His blood pressure in the right arm was 110/78 and in the right leg 110/88.

A copy of his pre-enlistment examination on 30 September 1947 was obtained from the Air National Guard. A roentgenogram of the chest was not available, but the medical examiner stated that the cardiovascular system was normal, the blood pressure was 118/74, and the resting pulse was 72. The patient stated that on his physical examination in 1947 he had had to sit and rest awhile and be re-examined with respect to his heart several times before being passed. His wife also stated that for 4½ years she had noted that at night his heart pounded forcefully and rapidly, and the patient confirmed this.

During his hospital stay his leukocyte count ranged from normal to 15,050 on 15 January. Sedimentation rates were repeatedly normal. He was given a course of 1.6 grams of cortisone over a period of 15 days. ECG's revealed a grade I heart block and T-wave inversion in leads I, II, III, aV_F, V_5, and V_7. On 23 January these changes were less pronounced. This was thought to be the result of the withdrawal of cortisone. Except for digitalis effects and episodes of rapid sinus tachycardia, there were no changes in repeated ECG's. Roentgenograms were made in an attempt to view the aorta, but the aortic arch was not clearly seen in both oblique views.

On 9 February he started receiving 600,000 units of penicillin every 6 hours. He had no fever during this time and was treated for congestive heart failure. He seemed to remain in status quo until his sudden death on 31 May. He was seen about 10 minutes prior to death by the patient in an adjoining room. At that time he appeared to be in good spirits.

At autopsy there was no pleural or peritoneal fluid. The pericardial sac contained about 150 cc. of clear straw-colored fluid. The heart was greatly enlarged and weighed 780 grams. On the anterior surface of the right ventricle there was a stellate patch of milky opacity measuring 4 by 5 cm., and a similar smaller epicardial thickening was present on the posterior surface of the right ventricle. The right auricle was enlarged. The left auricle was small and grossly normal. The myocardium showed no gross abnormalities. In the left ventricle, on its endocardial surface at the base of the trabeculae carneae, there were several white hyaline patches of endocardial thickening measuring 4 mm. or less in diameter. The leaflets of the mitral and tricuspid valves were diaphanous, and the chordae tendineae were thin, separate, and semitransparent. The aortic ring was normal. The coronary arteries were patent throughout. The mitral valve measured 14 cm.; the pulmonic, 9 cm.; and the tricuspid, 14 cm. The left ventricular wall was 18 mm. thick at the base of the mitral valve. The right ventricular wall was from 8 to 10 mm. thick. The aorta was smaller than normal. It measured 6.5 cm. in circumference at the aortic ring and 3.5 cm. just above the renal vessels. These measurements are within the normal range for this age. The wall also appeared thinner than normal, but there were no areas of localized constriction or point of apparent obstruction to blood flow. The intimal surface was smooth and glistening. The common iliac vessels also appeared proportionately decreased in size.

On microscopic examination the myocardial fibers were moderately enlarged. In some areas their nuclei were large, dark, and stellate. The endocardial nodules noted grossly consisted of nodular subendocardial fibrosis without cellular infiltration. Some of the small muscular myocardial arteries and the secondary divisions of the right and left coronary arteries showed hyperplasia of the subintimal fibrous connective tissue. The pulmonary artery and aorta showed similar subintimal fibrosis, but were otherwise normal. Hemosiderin-laden macrophages were diffusely scattered throughout the parenchyma of the lungs. Many of the smallest pulmonary arteries or arterioles had thickened walls. Except for some sparing in the portal areas, there was diffuse vacuolation of the parenchymal cells of the liver. The central venous spaces were moderately dilated. There was occasional slight lymphocytic infiltration of the portal triads.

DISCUSSION

von Bonsdorff *(6)* reviewed several cases described in the French and English literature and then cited 9 similar cases in a series of 5,848 hearts examined post mortem. He attempted to analyze the role that preceding respiratory infections, trauma, tuberculosis, et cetera, might play in these cases. He noted that temporary enlargement of the heart after influenza was mentioned in the literature several times. This functional decline with dilatation could lay the basis for a permanent heart disease. At any rate "if the heart disease continued and lead to the patient's death, it may happen that the morphological heart findings—apart from the dilatation and the hypertrophy which it conditions—are very insignificant, at least with the investigative means at our disposal." This concept is mentioned in some detail because most etiologic discussions include a group of conditions with which we are pathologically familar and can discern on post-mortem examination.

In the present case the search for the usual causes was frustrating. A respiratory infection sufficient to injure and dilate the heart should be sufficient to make the patient seek bed rest for a few days at least. This patient's mildly productive cough did not. The leukocytosis of 17,000 observed on his initial hospital admission could, however, have been caused by a streptococcal infection which might still have been active at that time. This raises the question of the patient having a poststreptococcal carditis similar to that found by Rantz et al. *(7)* in men convalescing from hemolytic streptococcic sore throat who presented no clinical evidence of a continuing pathologic process. In all these cases which were discovered by abnormal ECG's, the sedimentation rate was elevated and usually remained so for 3 or more weeks. We have good evidence against previous hypertension in our patient. Palpitation was an early and prominent symptom. This was noted in several previously reported cases but was not necessarily significant or related to episodes of tachycardia. Our patient, like Whittle's, had a small, delicate aorta, but the measurements of our patient's aorta were within the normal range.

Davies et al. *(8)* reported 9 patients with heart disease of unknown cause, most of whom complained initially of a "cold." Closer questioning revealed that these symptoms were actually those of incipient heart failure. In their group there was a striking

(6) von Bonsdorff, B.: Myocardial disease of obscure origin. Heart disease of unusual or unknown origin. Acta Med. Scandinav. 100: 403-435, 1939.

(7) Rantz, L. A.; Boisvert, P. J.; and Spink, W. W.: Hemolytic streptococcic sore throat; poststreptococcic state. Arch. Int. Med. 79: 401-435, Apr. 1947.

(8) Davies, R. R.; Marvel, R. J.; and Genovese, P. D.: Heart disease of unknown etiology. Am. Heart J. 42: 546-565, Oct. 1951.

similarity in the clinical course and physical findings, and these were similar to those of the case presented here. They observed that pericardial disease was a perplexing problem in differential diagnosis. In our patient, roentgenographic evidence was so suggestive of a pericardial effusion that a tap was attempted which was unsuccessful. Several consultants saw our patient and believed that he probably had a rheumatic myocarditis despite the normal sedimentation rates. One suggested the possibility that this was one of "the cases of idiopathic cardiac enlargement that have a poor prognosis in young people."

SUMMARY

A previously healthy 21-year-old soldier developed cardiac hypertrophy of unknown etiology. The elapsed time between the onset of definite cardiac symptoms and death from congestive heart failure was 9 months. The enormous heart showed no significant gross or microscopic findings except subendocardial fibrosis. The aorta and great vessels seemed small for a man of his size but measurements were within normal limits. Comparison with previously reported cases of cardiac hypertrophy of unknown cause shows a similarity in clinical course but adds nothing to the possible cause. The present case had some evidence of a preceding streptococcal infection. Cortisone was used in the treatment but no benefit was demonstrated.

BOOK REVIEW

Laboratory Technique in Biology and Medicine, by *E. V. Cowdry*, Research Professor of Anatomy and Director, Wemse Cancer Research Laboratory, Washington University, St. Louis, Mo., 3d edition. 382 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1952. Price $4.

This book on laboratory technic contains descriptions of hundreds of procedures which are often difficult to find unless a large library is available. Even to those who have immediately available a large scientific library, it will be extremely valuable as a quick reference book and a great timesaver because almost all of the technics are given in detail, arranged in alphabetical order, and cross-indexed. References are given on all procedures listed and also on those few not given in detail. The tremendous amount of technical data regarding stains given here should prove valuable to all pathologists and microscopists whether engaged in research or employed as technicians. This recently revised edition is highly recommended for all hospital laboratories.

—*Comdr. R. H. Walker, MC, USN*

EXPERIMENTAL SUBPERIOSTEAL DENTAL IMPLANTS

ROY L. BODINE, Jr., *Colonel, DC, USA (1)*

RAYMOND L. KOTCH, *Captain, DC, USA (2)*

THERE is tremendous interest today in subperiosteal dental implants for supporting prosthodontic appliances, especially as a means of restoring mastication for the patient who cannot tolerate conventional dentures. Although dental implants are not yet widely accepted, a controversy has begun about which much will be heard in the near future. The argument against the dental implant centers around the fact that there is a projection through the mucosa into the mouth, which causes a break in the epithelial covering of the body and is incompatible with health.

A histologic study of the tissue around dental implant abutments was presented by Phillip Loechler, before the Implant Academy at St. Louis in October 1952. He found that the crevice around an implant abutment is a normal gingival crevice lined with squamous epithelium and connective tissue. It occupies only one-third the length of the post which is shallower than the gingival crevice around a natural tooth. There are fewer inflammatory cells around an implant abutment than around a natural tooth. This proves, according to Loechler, that there is no leakage around the abutments if the steps of the procedure are properly performed. Much more work remains to be done before anything definite can be decided. Clinically, implants are successful, and no pathway into the body seems to exist. Bernier and Canby *(3)* suggested that because of the nature of oral tissue, an abutment protruding into the mouth may not be comparable to a protrusion externally into air.

Treatment of the patients here described was undertaken in the hope of contributing to the advancement of knowledge in the growing field of dental implants and of solving difficult prosthodontic problems. Two of these patients had marked resorption of the alveolus and were provided with full lower implant

(1) Post dental surgeon and prosthodontist, Camp Gordon, Ga.

(2) U. S. Army Hospital, Camp Gordon, Ga.

(3) Bernier, J. L., and Canby, C. P.: Histologic studies on reaction of alveolar bone to vitallium implants. J. Am. Dent. A. 30: 188-197, Feb. 1, 1943.

dentures. The other 2 were provided with 3 single-tooth implants in place of fixed bridgework. In regard to the single-tooth implants, it is too early for evaluation.

CASE REPORTS

Case 1. A 28-year-old woman came to the dental clinic complaining of an unsatisfactory lower denture. There was no retention and she suffered pain at numerous places on the denture-bearing area. The alveolus was almost completely resorbed, leaving only a small spiny ridge covered by dense fibrous tissue. Several attempts at achieving a successful lower restoration had been unsuccessful. The principles of the implant denture, emphasizing its experimental nature, were explained to her. Because of her many masticatory difficulties with conventional lower dentures she was eager to try an implant.

The method chosen was Killebrew's *(4)* improvement of the now obsolete technic described first by Goldberg and Gershkoff *(5, 6)*. Sterile measuring pins were inserted through holes in an acrylic baseplate into the anesthetized mucosa until bone was struck. These measurements were then transferred to corresponding areas of a conventional cast and the latter relieved accordingly over the implant area, in effect attempting to remove the thickness of the mucosa from the cast. The implant was then constructed of vitallium meshwork with provisions for 2 screws to immobilize it during the healing period.

When the mucoperiosteum was elevated and the implant seated on the bone, it was found to lack close adaptation at several points. This was related to the relatively inaccurate method of relieving the stone cast on the basis of measured probing. After removing the spiny ridge and adjusting the casting to the best possible fit, the meshwork with its 4 abutments was secured by a small screw on each side and the flap replaced and sutured. Healing was somewhat protracted and resuturing of the incision was required at 2 points.

During 11 months of follow-up there have been occasional short periods in which one or another of the abutments became tender, probably because of the lack of a good fit against the bone. The patient has, however, been exceedingly happy, as she can masticate far better than with her previous dentures (figs. 1–3).

---

(4) Killebrew, R.: Table Clinic, American Denture Society, Chicago, Ill., Feb. 1950.

(5) Goldberg, N. I., and Gershkoff, A.: Implant lower denture. Dental Digest 55: 490-494, Nov. 1949.

(6) Goldberg, N. I., and Gershkoff, A.: Further report on full lower implant denture. Dental Digest 56: 478-483, Nov. 1950

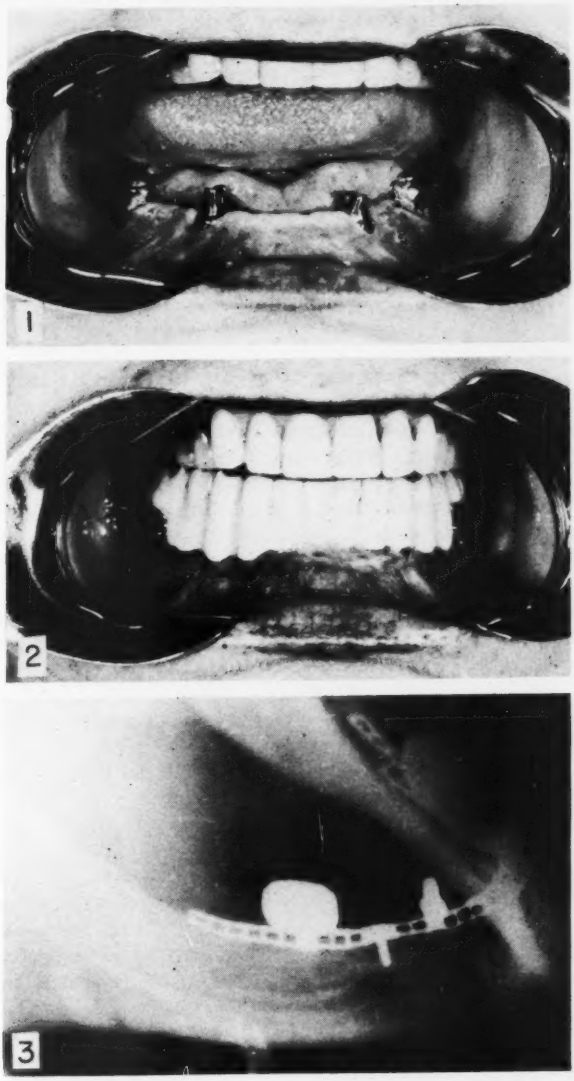


Figure 1 (case 1). Full lower implant 2 months after insertion. Note healthy tissue around abutments and over implant. Figure 2 (case 1). Superstructure in place. The teeth are butted against the mucosa in such a way as to give minimal tissue contact. Figure 3 (case 1). Roentgenogram showing implant which was too narrow for sufficient resistance against lateral stresses.

Case 2. A 23-year-old man with marked resorption of the maxillary and mandibular alveolar ridges was seen. This condition was believed to be due to multiple endocrine deficiencies. The mandible provided no support for a satisfactory denture, which had been attempted without success. In this case an improved technic first described by Berman *(7, 8)* and now generally accepted was used. A surgical impression is made directly on the exposed bone and the meshwork is extended buccally and lingually over the contour of the mandible. Two surgical operations were required. In the first, after elevating the periosteal flaps, an impression was taken with low-fusing compound in a previously prepared acrylic tray directly on the exposed bone surface.

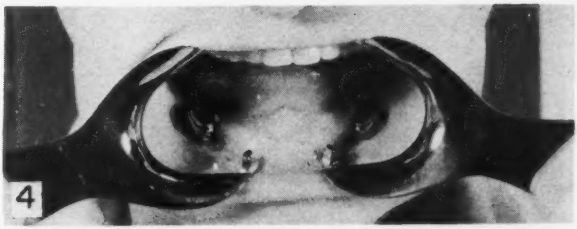
The second operation for the insertion of the implant was performed 2 weeks later. As a result of the accuracy of the direct surgical impression and the extension of the implant meshwork buccally and lingually over the curvature of the mandible, the implant meshwork fits the bone perfectly with no tendency to lateral displacement. Although not considered essential in this case, as an extra precaution a short screw was placed on each side between the abutments before the flaps were sutured. Most remarkably, there was no tenderness to the abutments, the patient using them in mastication after 2 or 3 days. Healing was rapid although posteriorly it was by granulation rather than by first intention. The superstructure was completed and inserted 4 weeks after the surgical insertion of the implant. Because this patient was a dental technician, daily observation was possible. Mastication improved remarkably up to the limits of function imposed by the upper denture where similar resorption has occurred. An upper implant denture may be made later (figs. 4–6).

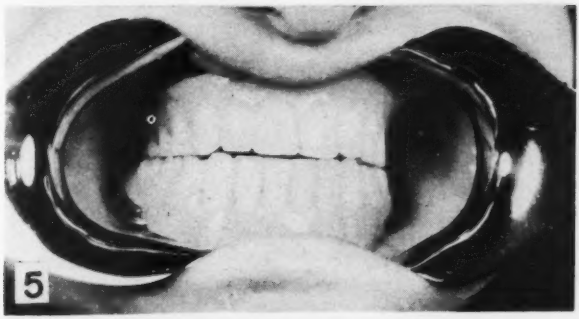
Cases 3 and 4. These 2 patients had 3 single-tooth implants for acrylic jacket crowns. It was expected that a successful result would avert the necessity of invading the adjacent teeth for conventional fixed bridgework. From these small implants much might be learned about implants in general which could be used in treating those patients requiring full-arch implants. An original technic was developed in which a butterfly-shaped meshwork was placed between 2 natural teeth carrying an abutment on which a gold-core acrylic jacket crown was constructed. Although it is too early for a final evaluation of the results, all 3 implants were highly satisfactory at the time of writing (figs. 7–10).

---

(7) Berman, N.: Implant technique for full lower denture. Washington Dent. J. 19: 15-17, Dec. 1950.

(8) Berman, N.: Physiologic and mechanical aspect of implant technique and its application to practical cases. Dental Digest 58: 342-347, Aug. 1952.





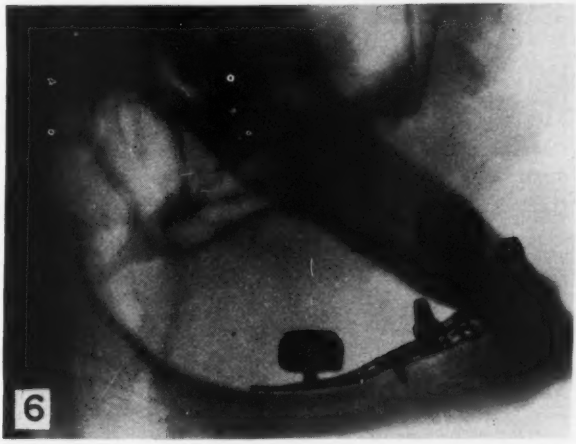
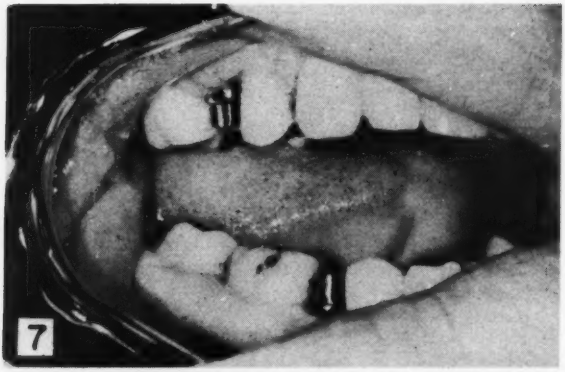
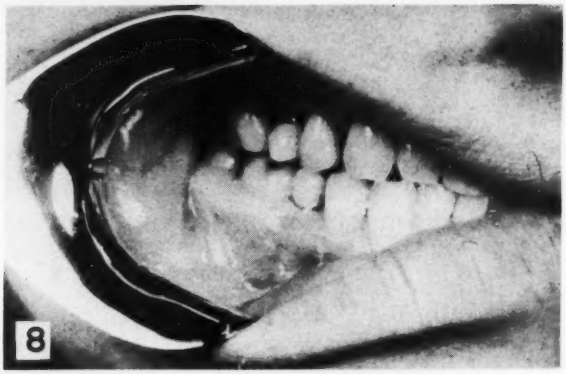


Figure 4 (case 2). Photograph taken 4 months after placing the implant. Note absence of buccal vestibule. Figure 5 (case 2). Superstructure in place. Note great occlusal height above resorbed alveolus. Figure 6 (case 2). Roentgenogram showing implant which fits perfectly against the bone. Note buccolingual width offering resistance to lateral stresses.





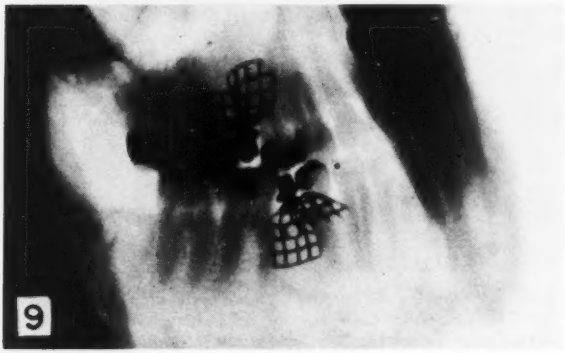


Figure 7 (case 3). Single-tooth implant for acrylic jacket crown. Note healthy tissue around abutment and over implant. Figure 8 (case 3). Completed crowns. Work was experimental and no attempt at an esthetic bucco-gingival adaptation was made. Figure 9 (case 3). Roentgenogram showing that no screws were used. Butterfly meshwork could have been extended farther buccally.

Comment. Although the direct surgical impression involves a rather complicated impression technic, the construction of the single-tooth implant is no more, and probably less, difficult, time-consuming, and painful than the construction of a fixed bridge with three-quarter or full-crown abutments.

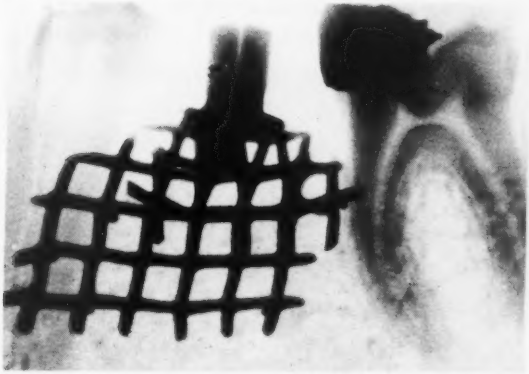


Figure 10 (case 4). Roentgenogram of improved implant. Note absence of collar on abutment, meshwork well away from adjacent teeth, and additional buccal extension.

DISCUSSION

The *surgical impression* is not started until a conventional upper and lower impression has been carried to an acceptable try-in stage. Also a thorough medical work-up is completed to rule out any systemic disorder, such as diabetes mellitus, tuberculosis, or cardiovascular disease, which might jeopardize healing. The location of the 4 implant abutments is studied in relation to the upper teeth and the lower arch and marked on the lower cast together with the tentative outline of the implant. An acrylic tray is made to this outline and lined with about 3/8 inch of low-fusing compound.

The patient is hospitalized prior to operation in order to minimize the postoperative reaction and to facilitate preoperative and postoperative medication and care. Preoperative preparation consists of giving 100 mg. of secobarbital sodium at bedtime and a light breakfast in the morning. One-half hour before operation the patient is given 100 mg. of secobarbital sodium and 0.4 mg. of atropine. A clean incision is made with a sharp scalpel on the crest of the ridge from one third molar area to the other cutting completely to the bone without retracing. The mucoperiosteum is carefully elevated buccally and lingually with no shredding or separation. This is extremely important

because the periosteum must lie over the implant meshwork so that regeneration of the connective tissue fibers, which cement the periosteum to the bone, will hold the implant firmly in place. Any sharp, bony ridges, spines, or irregularities are trimmed and smoothed. The lingual flap is retracted and secured by 1 or 2 sutures across the mouth under the tongue. The buccal flap may be similarly secured to the cheeks if necessary.

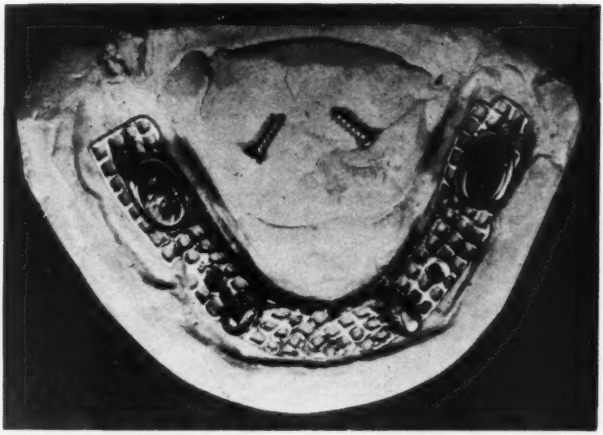


Figure 11. Full lower implant. Note open meshwork and buccolingual width. This cast was made from a direct surgical impression.

The impression is carefully taken in the compound-lined acrylic tray to include all of the exposed bone. It is sometimes helpful to cut the tray into 2 sections, take the impression of the right and left sides separately, and join them together in the mouth by an impression over both. The buccal and lingual flaps are replaced, and the incision closed with interrupted sutures. Retention sutures should also be inserted to resist the expected edema which might separate the lips of the wound in the succeeding 48 hours. Postoperative care includes: cold compress to the face to reduce edema; penicillin procaine or other suitable antibiotic; liquid diet for 48 hours; codeine intramuscularly for pain; and complete bed rest for at least 48 hours. The sutures are removed on about the fifth postoperative day.

The *implant meshwork* should cover all of the exposed bone. It must be brought over the contour of the mandible to produce a secure seating and resist lateral stresses. The implant must combine minimum bulk with adequate strength and rigidity. The edge must be thin and close against the bone. It may be as

irregular as necessary. Strengthening, if required, should not be placed at the edge, but midway between the crest and the buccal or lingual border. Many differently shaped abutments can be used. They may be tooth-shaped for clasps or parallel-sided for a precision fitting. In either case, they should be short of occlusion so that the occlusion is restored entirely by the superstructure. Healing is most rapid if the abutment is straight-sided without a collar projecting over the tissue (fig. 11). Because the implant is usually reserved for patients with severe alveolar resorption, the position of the mental foramen is relatively much higher than in the normal mouth. Adequate relief in the edge of the implant must be made to avoid the mental structures. Screws, if used, should be short enough to engage only the cortex of the bone. Penetrating the substantia spongiosa may endanger the mandibular canal.

The *surgical insertion* is performed 2 or 3 weeks after the surgical impression is made in order to allow for complete recovery from the effects of the first operation. The technic for raising the flaps for the insertion is the same as described for the surgical impression, the incision being made in the same line. The periosteum is easy to elevate because it has not yet become firmly reattached to the bone. Fixation of the implant may be achieved by 2 short screws, 1 on each side, or preferably by circumferential wiring. The screws should be removed after about 6 weeks but the circumferential wires may be left in permanently. In order to combat the swelling that follows such a large elevation of the periosteum, several mechanical methods are used: including: the placing of an acrylic splint immediately over the implant *(9)*; the winding of elastic bandage around the chin for the first 48 hours *(10)*; and the placement of deep retention sutures well into the muscle between abutments.

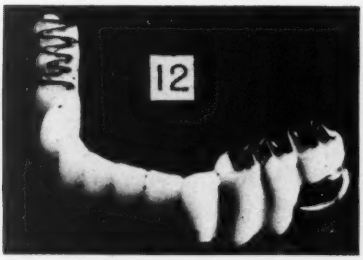
The *superstructure* consists of a framework with clasps or a precision female capping joined by rigid connectors *(11)*. The connectors must be high enough to clear the healed tissue without interfering with tooth placement. Acrylic, porcelain, or metal teeth of any kind may be used. As the stresses on the superstructure are borne entirely by the implant abutments, the buccolingual width should be minimal with the lightest possible tissue contact (figs. 12 and 13). The superstructure must fit

(9) Lew, I.: Simplified upper technique using immediate prosthesis. Dental Digest 58: 10-15, Jan. 1952.

(10) Berman, N.: Implant technique for full lower denture. Dental Digest 57: 438-443, Oct. 1951.

(11) Goldberg, N. I., and Gershkoff, A.: Fundamentals of implant denture. J. Prosthetic Dent. 2: 40-50, Jan. 1952.

the abutments without tension and should be easily removable. Any tension on an abutment will cause it to become tender. To insure a perfect fit, the superstructure frame is made by the dental laboratory, fitted directly to the implant abutments, and both are delivered together to the dentist.



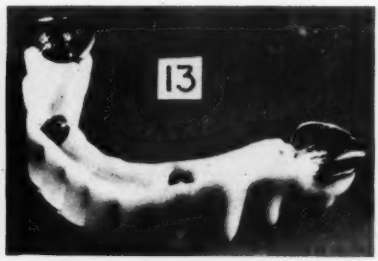


Figure 12. Occlusal view of superstructure. Metal insert posteriors are used against flat porcelain upper posteriors to reduce lateral stress on the flat upper arch. Figure 13. Tissue side of superstructure. Note clasps posteriorly and precision type of anterior abutments.

SUMMARY

The following fundamental principles of dental implants are believed to be sound:

1. An accurate fit of the implant meshwork against the bone is essential.

2. Only a surgical impression directly on the exposed bone can give sufficient accuracy for best results.

3. The implant should be of open meshwork and cover, within reason, as large an area of bone as possible.

4. The margins of the implant meshwork should be thin and flush against the bone. An irregular outline with projecting fingers is not objectionable.

5. The implant abutments should be small at their junction with the meshwork; 3 or 4 mm. in diameter is enough. Their sides should ascend vertically or may have a slight taper. A small shoulder may be made above the tissue, but there should be no collar projecting over the tissue. If desired, a slight undercut may be made for clasp retention.

6. The screws may be omitted if the implant is solid against the bone. In any case, 2 are sufficient and they should be shortened to reach just through the cortical plate. They are best removed before they cause irritation. Circumferential wiring is preferably used in lieu of screws and need not be removed.

7. The superstructure must fit the abutments perfectly without tension and should be easily removable. The superstructure frame should be made before the implant is inserted.

8. Both the implant and the superstructure framework must be of rigid construction so that there can be no springing of individual abutments and no distortion of the superstructure framework prior to completion of the superstructure.

CONCLUSION

The implant denture is a new concept. It offers a great deal of promise but has not yet been widely accepted. Although the results so far have been promising, there is a certain amount of hazard associated with dental implants. Some failures are inevitable not only soon after the insertion but months or years later. Implants at present, and probably for years to come, must be considered as experimental. Nothing is now known regarding the functional life expectancy of implants, nor the conditions that will be found around implants after 5, 10, or 15 years of use. No implant should be made unless the patient understands all this and still genuinely desires it. There is a definite place for the implant denture in the military service. A conventional denture often cannot be tolerated following maxillofacial wounds or injuries because of loss of tissue. An occasional commissioned or noncommissioned officer who cannot or will not wear ordinary dentures is seen. For such patients the implant denture offers new hope.

BOOK REVIEWS

The Philosophy of Psychiatry, Psychiatric Prolegomena, by *Harold Palmer,* M. D., 70 pages. Philosophical Library, New York, N. Y., publishers, 1952. Price $2.75.

In this interesting and closely-knit monograph, the author's purpose is to further the establishment of a theory and practice of psychiatry. He deplores the multiplicity of "schools" of psychiatric thought and the widespread looseness in the use of terms which at times complicates the elementary problem of communication. He discusses what to him are the more important basic assumptions prerequisite for a theory and practice of psychiatry. The central theme of these assumptions is a dynamic "self" which possesses both a bodily and a mental aspect. Closely connected

242918 O - 53 - 10

with the notion of self is the notion of purpose. A chapter on the primary entities of psychiatric discourse (awareness, consciousness, the self, thought, and mind, all of which chiefly concern mechanism) is followed by a chapter on the secondary entities of psychiatric discourse which are designated as personality, character, morale, the group, and the containing society. The author discusses his classification of clinical entities which, with some exceptions, is more or less conventional. His treatment orientation is broadly eclectic and all-inclusive. The management of a specific case is cited.

—*Lt. Col. W. J. Barker, MC, USA*

Surgery of the Eye, by *Meyer Wiener*, M. D., Emeritus Professor of Clinical Ophthalmology, Washington University School of Medicine; Honorary Consultant, Ophthalmology, Bureau of Medicine and Surgery, Department of the Navy, and *Harold G. Scheie*, M. D., D. Sc., F. A. C. S., Associate Professor of Ophthalmology, The Medical School and Hospital, and Assistant Professor of Ophthalmology, Graduate School of Medicine, University of Pennsylvania; Ophthalmologist, The Children's Hospital of Philadelphia. 3d revised edition. 449 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., publishers, 1952. Price $15.

This excellent textbook should be available to all physicians who perform minor or major operations on the eye. The illustrations are clear and instructive. The organization of the material is excellent. The discussion is reasonably brief but contains much sound information which can be obtained quickly. The chapters dealing with cataract and glaucoma are unusually good, but those dealing with operations on the lids and socket should be revised to exclude surgical procedures which are out of date and include such newer ones as the Hughes operation for the replacement of the lower lid, the Halving operation for closure of lid defects, the Butler operation for spastic entropion, and the procedure reported recently by Smith for repair of the outer canthus. On page 323, figures 310 and 311 show two methods for removal of the lateral orbital wall. These methods have been replaced by the use of a nonrevolving Stryker bone saw. A revolving bone saw is dangerous and difficult to use. The Krönlein procedure recently reported by Reese has been modified sufficiently to make it a most useful procedure in removal of orbital tumors and decompression of the orbit. This modification should be included in all surgical textbooks. In the chapter dealing with muscle surgery, the illustrations should show the use of absorbable suture material. Some of the operations performed on the oblique muscles as advocated by Berke and Fink should be included in this book. A discussion of operations for dacryocystorhinostomy seems incomplete without the inclusion of the excellent intranasal procedure advocated by Jones.

—*Col. M. J. Reeh, USAFR (MC)*

REMOVAL OF A CYSTIC CALCULUS FROM A DOG

DALE C. MOWBRAY, *Captain, VC, U. S. A.*

JAMES N. SHIVELY, *Captain, VC, U. S. A.*

A 10-year-old, 19-pound fox terrier was admitted to the Army Section of the Territorial Animal Quarantine Station, Honolulu, Hawaii, on its arrival from the United States to be held for the 120-day quarantine period required by Territorial law. Symptoms noted at this time were those of uremia and the frequent passage of small quantities of blood-stained urine.

Figure 1.

The diagnosis of cystic calculus was confirmed by roentgenogram, and a 6½-ounce stone was surgically removed (fig. 1). The calculus, which was of the alkaline type, measured 3 inches in length and 1-3/4 inches in diameter, thus making it one of the largest ever found in a member of the canine family. The animal made a rapid and uneventful recovery and was released from quarantine in apparent good health.

BOOK REVIEW

The Biochemistry of Gastric Acid Secretion, by *Edward J. Conway,* M. D., D. Sc., F. R. S., Professor of Biochemistry and Pharmacology, University College, Dublin, Ireland; Honorary Fellow, Royal College of Physicians, Ireland. Publication No. 119, American Lecture Series. A Monograph in The Bannerstone Division of American Lectures in Biochemistry and Biophysics. Edited by W. Bladergroen, Ir. (DELFT), M. A., Ph. D., Sandoz, Ltd., Basle, Switzerland. 185 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $6.50.

This monograph presents to the reader a composite review and correlation of selected research data on gastric acid secretion as published in current journals. The author has made an excellent presentation of the probable physiologic and biochemical origin of the secretions of the gastric mucosa and the controls thereof. Evidence is presented for the conclusion that the parietal canaliculi of the gastric mucosa are responsible for the secretion of HCl. The experimently determined relation between the milliequivalent concentration of Cl, NA, K and the milliequivalent of the resulting gastric acidity is discussed. The extent of secretion of HCl is mathematically presented on the basis of a redox theory, concluding that the parietal secretion containing HCl has always a total concentration isosmotic with the blood.

Experimental stimulation of the parietal cells and the probable site of action of psychic and chemical phases of stimulation are briefly and adequately discussed. The secretion of the hydrogen ion and its relationship to the ionic components of the intercellular and extracellular fluids is also explained. The author presents several experimental facts illustrating the similarity of the production of acid in yeast and in the gastric parietal cell and points out that in each instance acid secretion leads to an equivalent intercellular alkalinization. Other theories of HCl production are also considered. The energetics of gastric secretion are discussed in detail.

The intercellular and extracellular role of gastric urease is described. Points of corroborative evidence on comparative physiologic mechanisms between various animals and yeast are included to substantiate the concepts of the activities of the gastric mucosa presented. This book should be of great interest to investigators and students in this field.

—Maj. W. H. Lee, USAF (MSC)

CALCIFIED COSTAL CARTILAGE

KARL A. YOUNGSTROM, *Lieutenant Colonel, MC, USA*

VARIATIONS in the number, length, and shape of ribs are well known, but usually they cause no symptoms. Notable exceptions are some cervical ribs and the changes in the rib cage associated with a severe degree of sternum recurvatum. The present case is interesting because of the associated symptoms.

CASE REPORT

The patient was admitted to the 8th Station Hospital, Kobe, Japan because of diarrhea. He had some tenderness in the right upper abdominal quadrant. Several roentgenograms were made and a calcific density was seen overlying the right upper quadrant, the exact nature and relations of which could not be determined from that study (fig. 1). Stereoscopic views later proved the density to be bilateral in the anterior abdominal wall in line

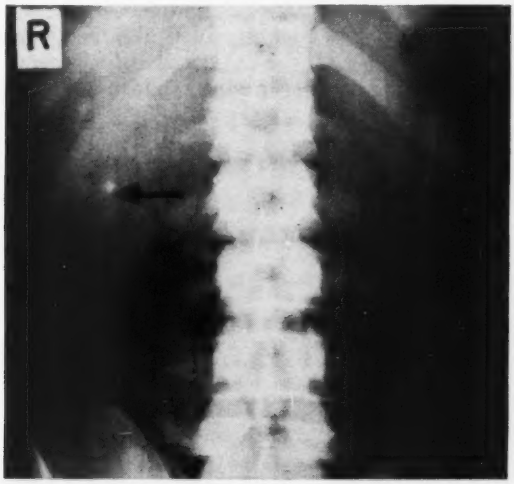


Figure 1. Black arrows show the calcified tenth costal cartilages. There are two areas of calcification in the right tenth costal cartilage.

with the continuation of the tenth ribs. The one on the right extended much further toward the midline than that on the left. By the time these studies were completed, the patient had recovered

from his diarrhea but the abdominal tenderness persisted in the region of the tip of the right tenth rib. Further questioning revealed that he had noted this type of pain on several occasions in the preceding years and had associated its appearance with violent exercise such as throwing a baseball.

A surgical consultant recommended a resection of the distal portion of the right tenth rib. This operation was performed and an irregular cartilaginous growth forming a sharp tip pointing upward was found in the distal portion of the rib. Another small area of irregular cartilaginous growth was just proximal to this. These two areas formed about 4 cm. of excessive growth toward the midline. It was believed that the patient's pain was due to the distal portion of this rib irritating and elevating the sheath of the right rectus muscle. The external oblique muscle was incised to expose the more proximal portion of the rib. The distal 5 cm. of the rib was removed and the cut end of the rib was rounded with a bone rasp. Six weeks after operation the patient was symptom-free, even while throwing a baseball.

CONCLUSIONS

An unusual anatomic variation in the form of an elongated tenth rib traumatized the rectus sheath during contraction of the muscle. This case illustrates the advantage of stereoscopic roentgenograms in localizing the cause of the patient's symptoms. An unusual cause of pain in the right upper abdominal quadrant is reported.

BOOK REVIEWS

Pharmacology in Clinical Practice, by *Harry Beckman,* M. D., Director, Departments of Pharmacology, Marquette University Schools of Medicine and Dentistry; and Consulting Physician, Milwaukee County General Hospital and Columbia Hospital, Milwaukee, Wis. 839 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

This book was written to supersede the author's well-known "Treatment in General Practice." It is intended to teach second-year medical students to "think in terms of specific diseases and the opportunities they present to the pharmacologist, in terms of symptoms" rather than to employ more customary methods which the author believes are incorrect and are "based on the premise that to fill a young man with scientific facts regarding a large number of drugs would equip him to use those drugs subsequently in the treatment of his patients." Much of the book is concerned with descriptions of the cause, frequency, symptoms, and lesions of numerous diseases, often concluding with a statement such as: "This subject has no pharmacological aspects." Without judging the adequacy of this material, ordinarily covered in textbooks of internal medicine, I believe that this approach may be of value to the practitioner but under the present system of medical education it is not suitable for second-year medical students. The material is up to date and well-indexed so that one may find the essential actions and uses of important drugs even though they be scattered throughout the book.

—Lt. Col. P. K. Smith, USAFR

Physiology of the Eye; Volume II, Vision, by *Arthur Linksz,* M. D., F. A. C. S., Assistant Clinical Professor of Ophthalmology, New York University, Postgraduate School of Medicine; Associate Attending Surgeon, Manhattan Eye, Ear and Throat Hospital, New York, N. Y. 869 pages; illustrated. Grune & Stratton, Inc., New York, N. Y., publisher, 1952. Price $19.

This exhaustive treatise is written for the student and not the casual reader in ophthalmology. It is probably the most complete work in the field today and is a "must" for the student desiring a thorough knowledge of the complicated processes of vision. Part I is devoted to an analysis of sensations, beginning with the adequate stimulus and developing in an orderly fashion the physical and psychologic aspects of vision. Color

vision is thoroughly discussed. Part II describes pattern and detail vision and part III, the perception of spatial relationships with the aid of many illustrations. The continual application of principles to daily sensations does much to hold the reader's attention. Part IV, dealing with vision and the oculorotary reflexes, is easier to read than the first portions of the book. The sections on disjunctive rotations, the neuro-anatomic basis of optically elicited vertical rotations, torsion movements, and fusion are especially well written. This book is a fitting companion to volume I (Optics), and the reader will find himself looking forward to the publication of volume III.

—*Lt. Col. K. E. Hudson, MC, USA*

Neurosurgery in General Practise, by *Adrien Ver Bruggben,* M. B., Ch. M., M. S., F. A. C. S., Clinical Professor of Neurological Surgery (Rush), University of Illinois College of Medicine; Neurosurgeon to the Presbyterian Hospital of Chicago; Formerly Attending Neurosurgeon, Cook County Hospital, Chicago, Ill. 665 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1952. Price $14.

This book is not for the neurosurgeon but is directed to others who, at intervals, see patients who may require neurosurgical procedures. It will be welcomed by medical officers scattered all over the world who may find themselves in an awkward position while trying to determine what emergency care should be given and what disposition should be made of their questionable neurosurgical cases. The index is complete in every detail.

Fundamentals are packed into the discussion of such lesions as herniated nucleus pulposus, head injury, cerebral tumor, cerebrovascular diseases, and many others. To assist the physician who uses this book, there are numerous illustrations and many representative case histories. Some of the items of practical value which are available to the reader are: the type of sedation to be used in head injuries; the appropriate use of oxygen; a suggested method of control of increasing intracranial pressure; types of conservative treatment for the patient with a herniated disk; stellate block and positioning of the head in vascular accidents; and contraindications to spinal puncture. In the chapter on coma there is an outline of (1) various causes of coma which is useful in differential diagnosis and (2) the various treatments for spinal cord injuries.

As far as I know, this is the first book in the field of neurosurgery directed to the general practitioner. It fulfills a great need and should make for smoother and more intelligent liaison between the general practitioner and the neurosurgeon. With this book the general practitioner is able to recall information which he uses only at intervals, and thus he will make more accurate deductions and speedier decisions in the management of his patients.—*Lt. Comdr. G. Clark, MC, USN*

The History of American Epidemiology, by *C. E. A. Winslow,* Dr. P. H., Professor Emeritus, Yale University School of Medicine; Editor, American Journal of Public Health; *Wilson G. Smillie,* M. D., Professor and Chairman, Department of Public Health and Preventive Medicine, Cornell University Medical College; *James A. Doull,* M. D., Medical Director, Leonard Wood Memorial (American Leprosy Foundation); *John E. Gordon,* M. D., Professor and Chairman, Department of Epidemiology, School of Public Health, Harvard University. Edited by *Franklin H. Top,* M. D., Professor of Epidemiology and Pediatrics, College of Medical Sciences, University of Minnesota. Sponsored by *The Epidemiology Section, American Public Health Association.* 190 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1952.

This monograph by 4 distinguished leaders in the field of preventive medicine and public health relates the development and progress of American epidemiology in its broadest sense. Developments occurring elsewhere in the world are taken into account. Only short sections of this book are written in a purely narrative style whereas most of the book is devoted to a discourse on pertinent events, discoveries, and the "thinking of the day" with a discussion of their impact on the course of the evolution of epidemiology in this country. This book will afford interesting and enjoyable reading for all persons interested in preventive medicine and public health.

—*Col. A. F. Scheele, MC, USA*

Nutrition and Diet in Health and Disease, by *James S. McLester,* M. D., Professor of Medicine Emeritus, University of Alabama, and *William J. Darby,* M. D., Ph. D., Professor of Biochemistry and Director of the Division of Nutrition, Vanderbilt University. 6th edition. 710 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

This new edition appears to be planned for the use of nutritionists. The material is presented in a concise, understandable form. Unlike many other texts on nutrition, it omits historical data and is restricted to information of practical value. Each chapter has an extensive bibliography.

The section on normal nutrition briefly reviews the digestive processes, utilization of food, and caloric needs before discussing each class of food in a separate chapter. Tables are used in great numbers to demonstrate the values of various foods in each category. An interesting addition from the standpoint of those who must compute dietary values is a table giving vitamin content of many popular prepared cereal foods now on the market. A section on food costs gives valuable help in budgeting. A summary on the normal diet gives practical information on menu planning, based on the "basic 7" concept of the balanced diet, with sample menus compiled on a cost basis.

In the section on nutrition in disease each disease is discussed with reference to its cause, pathology, symptoms, laboratory findings, and treatment. The latter includes a discussion on medica-

tions. If metabolic changes are of special importance, these are discussed at length. Recent trends in dietary management, such as higher carbohydrate diets in treating diabetes mellitus and high protein diets in treating peptic ulcers are evaluated. Fundamental considerations are outlined and sample menus are given. The menus use common household measurements. A classification of foods on an exchange basis should be of special practical value in planning diabetic diets.

Two special chapters are added, one on nutrition in surgery, by Lund and the other on nutrition in industry, by Goodhart. In the appendix special methods of feeding and the storing and processing of foods as regards vitamin losses are discussed and the different cooking methods are evaluated from the same standpoint. Additional tables on food values, normal weights, and other statistics complete the book. One table lists foods accepted by the Council on Foods and Nutrition of the American Medical Association.—*Lt. H. M. E. Linnenbruegge, NC, USN*

Tuberculosis, by *Saul Solomon,* M. D., Associate Visiting Physician, Fourth Medical Division, Bellevue Hospital, New York, N. Y., Associate Clinical Professor of Medicine, New York University Post-Graduate Medical School. 310 pages; illustrated. Coward-McCann, Inc., New York, N. Y., publisher, 1952. Price $3.50.

The author indicates in his introduction that the "aim of this small book is to present to the general reader in a convenient and readable form, the current knowledge and recent advances in the subject." He fulfills his objective admirably. This instructive book should be required reading for all tuberculosis workers and the many persons concerned in the work of official and volunteer public health agencies. Recent advances in treatment and research are well covered and the history of tuberculosis as presented by the author is truly fascinating. The up-to-date statistics on the tuberculosis problem in the United States, including that of veterans of military service, is most informative. The section on BCG vaccine is an unusually fair appraisal of this controversial subject. The author properly advises hospitalization for the patient with newly discovered tuberculosis, but indicates without sufficient explanation that patients with exudative and productive tuberculosis can be cared for at home. Unfortunately, the review on the classification of lung tuberculosis is subject to misinterpretation by the uninitiated. It is stated that patients with "exudative" tuberculosis do not require streptomycin or other special treatment and that patients with "chronic productive" tuberculosis require no special treatment for the greater part of their illness except for rest during flare-ups. In actual practice, most new patients with active pulmonary tuberculosis of any type now receive antituberculotic drugs and a definitive program of management based on their

individual needs. The diagnosis of exudative (reversible) and caseous-pneumonic (irreversible or necrotic) disease is usually determined with certainty only after an extensive period of rest and drug therapy and observance of the response to such a program of management. In other words, the diagnosis of various types of tissue response is usually made by hindsight and it is hazardous to withhold special treatment on the basis of a tentative diagnosis. Nevertheless this is a fine summary of the present-day knowledge of tuberculosis and it is highly recommended for the general reader and the medical library of all hospitals.

—*Col. C. W. Tempel, MC, USA*

Handbook of Tropical Dermatology and Medical Mycology, Volume 1, edited by *R. D. G. Ph.* Simons, Amsterdam, Senior Lecturer at the Dermatological Clinic of the University of Leyden; Dermatologist in Charge at the Civilian Hospital, Amsterdam. 845 pages; illustrated. Elsevier Publishing Co., New York, N. Y., publishers, 1952. Price $15.

Volume I, the collected work of about 40 contributors, consists of the following sections: (1) General Survey; Dermatology among Children; Pigmentations, Depigmentations; (2) Diseases due to Protozoa, Spirochaetes and Related Conditions; (3) Diseases due to Bacteria; (4) Diseases due to Cocci; (5) Diseases due to Rickettsiae and Viruses; and (6) the Miliary Group of Dermatoses and Tropical Acne. Each section is for the most part authoritatively and clearly presented and leaves the reader with an excellent grasp of the subject matter discussed. The presentations are modern in their concepts, and to one at all familiar with dermatologic terminology, easily and readily understood. Discussion of therapy in each section is brief, to the point, and up to date for the most part.

The editor was faced with a tremendous problem in presenting the many contributions in various languages in English. There is little overlapping in the various sections, and where overlapping does occur, there are surprisingly few conflicting concepts expressed by the contributors. The illustrations are many and excellent.

The section on general survey by the editor is made especially entertaining by the author's scholarly, albeit somewhat discursive style, his intimate etymologic knowledge, and diverse experience in tropical medicine.

This book should be of great value to anyone practicing dermatology in the tropics and also to dermatologists throughout the world, because many of the subjects presented are not confined to the tropics. The only fault found was the relative frequency of minor typographic errors. I am eagerly anticipating the publishing of Volume II of this handbook.—*Commander V. Hall, MC, USN*

Congenital Anomalies of the Heart and Great Vessels, by *Maurice A. Schnitker*, B. S., M. D., F. A. C. P., Lt. Col., A. U. S., Medical Consultant, Pacific Theater, World War II; Director of Medicine, St. Vincent's Hospital; Senior Active Staff, Toledo Hospital and Maumee Valley Hospital; Consulting Staff, St. Luke's Hospital and Toledo State Hospital. 306 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1952. Price $8.

In this monograph there is a short but lucid review of the embryology and morphology of the heart and great vessels and the cause of, incidence of, and phenomena associated with congenital anomalies in them are discussed. The lesions are divided into an acyanotic and a cyanotic group and there is a special section on the complicating conditions associated with these anomalies. This book gives precise descriptions of these conditions in a way which is easily understood by the clinician. It is well organized, well illustrated, and concise. The basic principles, particularly the developmental anatomy and pathophysiology, are stressed. This monograph should be useful for the general practitioner, internist, and pediatrician.

—Commander T. D. Cuttle, MC, USN

Office Psychiatry, The Management of the Emotionally and Mentally Disturbed Patient, by *Louis G. Moench*, M. D., Assistant Clinical Professor of Medicine and of Psychiatry, University of Utah School of Medicine. 310 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1952.

If we are to consider the vital need of more psychiatric understanding on the part of physicians in general, we must give them material such as is contained in this book and which can be used on a practical level. Such measures will partially alleviate the increasing demand of the public for psychiatric service. Dr. Moench presents the basic fundamentals clearly, logically, and in an easy-to-read manner. He avoids the theoretical and obscure formulations which, in the main, would militate against the delving into such problems by the average busy physician. This book should be a useful source of psychiatric information for the busy practitioner. One might criticize the naivete of the illustrations, which to some degree reduces the dignity of the subject to the comic-strip level. Their dynamic impact, however, is inescapable, and they clarify various points in an objective manner.

—Capt. T. P. Rogers, MC, USN

Biological Chemistry, An Introduction to Biochemistry, by *Alexander Gero*, Ph. D., Associate Professor of Pharmacology, Hahnemann Medical College, Philadelphia; Formerly Associate Professor of Chemistry, Villanova College, Villanova, Pa. 340 pages; illustrated. The Blakiston Co., Inc., New York, N. Y., publishers, 1952.

As the author has stated that this is a textbook or a teaching manual, it could not be recommended to physicians or biochemists for any other purpose. Its chief virtue lies in the liberal use of the most modern concepts of theoretical organic and physical

chemistry applicable to biology and medicine. The chief criticism lies in superficiality and a distribution of emphasis that may not meet with general acceptance. This or any other attempt to compress fundamental physical chemistry, theoretical organic chemistry, and their application to proteins, carbohydrates, and fats into 150 pages liberally diluted with structural formulas could not be otherwise. The author has made a very good attempt to reduce the science of chemistry to a "read as you run" basis.

—Lt. Col. M. E. Freeman, MSC, USA

Lumbar Disc Lesions, Pathogenesis and Treatment of Low Back Pain and Sciatica, by *J. R. Armstrong,* M. D., M. Ch., F. R. C. S., Orthopaedic Surgeon to the Metropolitan Hospital; Orthopaedic Surgeon to Lambeth Hospital; Visiting Orthopaedic Surgeon to Manor House Hospital (Industrial Orthopaedic Society), Honorary Consulting Orthopaedic Surgeon to Royal Waterloo Hospital for Children and Women; Late Visiting Orthopaedic Surgeon to the Ministry of Pensions Hospital, Stoke Mandeville; Late Orthopaedic Specialist, Royal Air Force Medical Service. Foreword by *H. Osmond-Clarke,* C. B. E., F. R. C. S., Orthopaedic Surgeon, London Hospital; Senior Visiting Surgeon, Robert Jones & Agnes Hunt Orthopaedic Hospital, Oswestry; Civilian Consultant in Orthopaedic Surgery to the Royal Air Force. 228 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publisher, 1952.

In this monograph on lumbar disk lesions the author has well-organized material, drawn from the literature as well as from his own personal experience, and has presented it in an orderly fashion. The anatomy, function, and lesions of the lumbar disk are fully described. The clinical findings and differential diagnosis are thoroughly discussed. The conservative and operative methods of therapy with their complications are described in detail with indications and contraindications for specific types of therapy. The author deals with much controversial matter and indicates his own views regarding the pathogenesis of the pathologic processes and methods of therapy.

This interesting presentation of a complex subject would be a valuable adjunct in the library of any orthopedic surgeon or other physician who treats patients with back pain.

—Col. J. W. Batch, MC, USA

Ophthalmic Pathology, An Atlas and Textbook, by *Jonas S. Friedenwald, Helenor Campbell Wilder, A. Edward Maumenee, T. E. Sanders, John E. L. Keyes, Michael J. Hogan, W. C. Owens,* and *Ella U. Owens* with the editorial assistance of *Helen Knight Steward.* Published under the joint sponsorship of *The American Academy of Ophthalmology and Otolaryngology* and *The Armed Forces Institute of Pathology.* 489 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

The revision, or rather replacement, of the old DeCoursey and Ash Atlas brings to us an excellent book. This new text is more than an atlas; it is a complete text of ocular pathology, giving

adequate descriptions of all pathologic states, each accompanied by many well-prepared black and white plates. The authorship is a compilation of opinions by 8 highly qualified persons. The first 2 chapters deal with the normal eye and include plates and descriptions of its physiology and histology. The next 2 chapters present the changes associated with advancing age and a detailed description of the mechanics of inflammation. A new style is set in that the reference plates are not dispersed throughout the descriptions but follow the bibliography of each chapter on separate pages. Subsequent chapters describe ocular lesions in a highly lucid manner. A final extensive section on tumors concludes the text. The volume is well prepared and the format is pleasing.—*Commander D. A. Mills, MC, USN*

The 1952 Year Book of General Surgery (June 1951-May 1952), edited by *Evarts A. Graham,* A. B., M. D., Emeritus Professor of Surgery, Washington University School of Medicine; formerly Surgeon-in-Chief of the Barnes Hospital and of the Children's Hospital, St. Louis. With a Section on Anesthesia edited by *Stuart C. Cullen,* M. D., Professor of Surgery and Chairman of Division of Anesthesiology, State University of Iowa College of Medicine and Hospitals. 670 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1952. Price $6.

This Year Book contains abstracts of about 350 articles from domestic and foreign journals which were published during the period from June 1951 through May 1952. The articles are well selected and the abstracts are entirely adequate. There is a brief introduction by Dr. Graham. Most of the numerous illustrations deal with steps in surgical technic. Of particular interest are the sections on water and electrolytes and peripheral veins (including thrombophlebitis).

Of particular interest in the portion on anesthesia are the sections on muscle relaxants and local anesthetics.

Pertinent, constructive, and thought-provoking comments by both editors appear throughout the book. It is only to be regretted that they are not more numerous.—*Col. H. A. Conrad, MC, USA*

Diseases of the Heart and Arteries, Anatomical and Functional Disturbances of the Circulation, Treatment, by *George R. Herrmann,* M. S., M. D., Ph. D., F. A. C. P., Professor of Medicine, University of Texas, Director of the Cardiovascular Service and Heart Station, University Hospitals; Consultant in Vascular Diseases, United States Marine Hospital; Consultant in Medicine to Surgeon General, United States Army. 4th edition. 652 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1952.

This new edition is not just a revision of previous editions but is essentially a new text of wider scope and arrangement. It comprises 30 chapters and an appendix. The arrangement is excellent, beginning with the important developmental and structural anatomy of the heart and the physiology of circulation and

progressing to the symptoms and signs of heart disease, relevant laboratory studies, method of study, detailed consideration of clinical features, diagnosis, and treatment of the various types of heart disease. A chapter is devoted to peripheral vascular diseases and another to military cardiovascular examinations and interpretations. The appendix consists of a condensed summary of important cardiovascular data and an enumeration of common errors in the diagnosis of heart disease. A well-prepared index is included. References of a general nature are cited at the end of each chapter. The text is well illustrated.

This logically arranged, concise treatise should prove valuable to the undergraduate and postgraduate student and clinician.

—Col. T. W. Mattingly, MC, USA

Diseases of Metabolism, Detailed Methods of Diagnosis and Treatment, edited by *Garfield G. Duncan,* M. D., Director of Medical Division, Pennsylvania Hospital; Clinical Professor of Medicine, Jefferson Medical College, Philadelphia, Pa., with 20 contributors. 3d edition. 1,179 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1952.

This edition will be welcomed by those familiar with the earlier editions and will undoubtedly make many new friends. Eight contributors to the second edition do not appear in the third, but 7 new authors have been added. The chapter entitled "Nutritional and Metabolic Aspects of Disorders of the Blood" has been dropped practically in toto, and a new chapter, entitled "Porphyrin Metabolism," has been added. A most welcome addition to this edition is an alphabetical author index.

The chapters dealing with (1) carbohydrate metabolism, (2) water balance in health and disease, (3) gout, (4) diabetes mellitus, and (5) diseases of the thyroid have been extensively rewritten. The chapter on diabetes mellitus is comprehensive, contains a lucid discussion of the various types of insulin, and follows the "exchange system" of diet prescription advocated by The American Diabetes Association. In the chapter on carbohydrate metabolism, Dr. Soskin presents his own opinions on certain controversial matters as well as those of other observers. The section on porphyrin metabolism is greatly enhanced by an interesting color plate. Throughout the book the pertinent American literature through 1951 has been fully incorporated with a smaller number of references to articles published in 1952.

Omissions and errors are practically nonexistent. Few readers will be misled by the typographic error on page 649 which states that mineral oil may prevent vitamin B absorption. The Aub-Dubois standards for the normal BMR are contained in table 3 and not table 5 as erroneously stated on page 5 (but were contained in table 5 in the preceding edition). An otherwise complete chapter on diabetes insipidus fails to mention the hypotonic

saline test. It seems unfortunate that the authors of chapters 7 and 19 failed to conform to the practice followed by the others of numbering references so that the source material for specific statements can be clearly and promptly identified.

The editor has wisely refrained from eliminating duplication of subject material by different contributors. He was faced with the dilemma posed by the artificial and barely discernible separation of metabolism from endocrinology. A chapter devoted to the integration of these overlapping fields would be a welcome addition to future editions and would be a logical development of the present introductory chapter.

—Lt. Col. F. J. Hughes, MC, USA

The 1952 Year Book of Radiology (June 1951-June 1952), Radiologic Diagnosis, edited by *Fred Jenner Hodges*, M. D., Professor and Chairman, Department of Roentgenology, University of Michigan, and *John Floyd Holt*, M. D., Associate Professor, Department of Roentgenology, University of Michigan. Radiation Therapy edited by *Harold W. Jacox*, M. D., Professor of Radiology, College of Physicians and Surgeons, Columbia University; Chief, Radiation Therapy Division, Radiologic Service, Presbyterian Hospital, New York, N. Y., and *Vincent P. Collins*, M. D., Professor and Chairman, Department of Radiology, Baylor University, College of Medicine; Radiologist-in-Chief, Jefferson Davis Hospital, Houston, Tex. 416 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publisher, 1952. Price $7.50.

As stated by the editors in the introduction to the diagnostic section, their purpose has remained, as in the past, to bring to the reader in abstract form the most pertinent and noteworthy writings on radiology from world literature. This they have accomplished to a remarkable degree. The larger portion of the volume is again devoted to diagnosis and diagnostic methods with emphasis on common errors in interpretation, particularly with the use of contrast media and especially in visualization of the vascular systems in regard to anomalous variations. Dangers and precautions are emphasized. Technics are illustrated. The section on radiation therapy includes the newer uses of isotopes. The latest concepts in the use of supervoltage are discussed. Radiation hazards and injuries are reviewed. Smaller sections are devoted to physics, dosimetry, and radiobiology. Statistical reports are skeptically analyzed and the editors' pertinent comments placed strategically to stimulate the reader's critical evaluation. American radiologic journals are well covered and there is generous coverage of articles of radiologic interest from other specialty fields. The foreign literature has been judiciously scanned. The volume is well indexed; the illustrations are excellent; and the binding is of durable quality.

—Col. J. A. Isherwood, MC, USA

U. S. GOVERNMENT PRINTING OFFICE : O—1953